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MINERALS YEARBOOK

Area Reports: International 2011

Asia and the Pacific

Volume III

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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industries during 2011 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the mineral industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics of domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 190 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's mineral industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

Suzette M. Kimball, Acting Director

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Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the Internet at http://www.usgs.gov or by contacting the Earth Science Information Center at 1-888-ASK-USGS. For specific information about this publication, contact the Chief, Global Minerals Analysis Section, National Minerals Information Center (NMIC), at (703) 648-4976, or the NMIC secretary at (703) 648-4961. Additional minerals information may be accessed on the Internet at http://minerals.usgs.gov/minerals.

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Acknowledgments

The Country Specialists in the National Minerals Information Center, U.S. Geological Survey, in preparing the International Review regional books of volume III of the Minerals Yearbook, extensively use statistics and data on mineral production, consumption, and trade provided by various foreign Government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations are gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, United Nations publications, and the domestic and foreign technical and trade press. Of particular assistance were reports submitted by the Resource Reporting Officers and other officers of the Department of State in U.S. Embassies worldwide. Their contributions are sincerely appreciated. Internal statistical support was provided by the staff of the Data Collection and Coordination Section of the National Minerals Information Center.

The staff of the National Minerals Information Center gratefully acknowledge the invaluable contributions that John H. DeYoung, Jr., has made to the quality of the Minerals Yearbook during his tenure as Director of the National Minerals Information Center from January 1996 until June 2013.

The regimes of some countries reviewed in this volume may not be recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not to be construed as conflicting with or being contradictory of U.S. foreign policy.

W. David Menzie
Acting Director, National Minerals Information Center

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The Mineral Industries of Asia and the Pacific

By Yolanda Fong-Sam, Chin S. Kuo, Lin Shi, Pui-Kwan Tse, Susan Wacaster, and David R. Wilburn

The 31 countries and territories of the Asia and the Pacific region reported on in the Minerals Yearbook have a total area of about 30 million square kilometers, which accounts for about 20.1% of the world total. Data and information for the majority of this report do not include Kiribati, Maldives, the Marshall Islands, the Federated States of Micronesia, Palau, Tongo, or Vanuatu. The total population was about 3.9 billion, which accounted for 55.6% of the world total in 2011. China and India, which were the world's two most populous countries, accounted for 66.7% of the region's total population. The real gross domestic product (GDP) growth rate of 30 of the region's countries increased in 2011 compared with that of 2010 whereas that of only one country, Japan, was reported to have decreased (by 0.8%). The GDP of 17 of the 31 countries and territories of the Asia and Pacific region increased by at least 5% in 2011, but for many countries the growth rate was lower than in 2010. The GDP of Mongolia, which was the country with the largest GDP growth in 2011, increased by 17.5% in 2011 compared with an increase of 6.4% in 2010 and a decrease of 1.3% in 2009 (tables 1, 2).

Australia and China were among the world's leading mineral producers in 2011. Australia has large resources of bauxite, coal, cobalt, copper, diamond, gold, iron ore, lead, lithium, manganese, mineral sands, nickel, tantalum, and uranium. China has large resources of antimony, arsenic, barite, coal, fluorspar, gold, graphite, iron ore, magnesium, rare earths, strontium, tin, tungsten, and zinc. India also was one of the world's significant mineral producers and has large resources of barite, bauxite, chromium, iron ore, manganese, rare earths, and salt. Other significant mineral producers in the region were Indonesia, which has large resources of coal, copper, gold, nickel, and tin; Mongolia, which has large resources of copper, fluorspar, and molybdenum; Papua New Guinea, which has large resources of copper, gold, and molybdenum; and the Philippines, which has large resources of copper, gold, and nickel.

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The U.S. Geological Survey (USGS) acknowledges and thanks the following foreign Government agencies, international institutions, and private research organizations for providing mineral production statistics, basic economic data, and exploration and mineral-related information:

For mineral production statistics—

- Australia—Australian Bureau of Agricultural and Resource Economics and Sciences, and Western Australia Department of Minerals and Petroleum Resources;
- Bhutan—Ministry of Trade and Industry, Department of Geology and Mines;
- Brunei—Prime Minister's Department, Petroleum Unit;
- Cambodia—Ministry of Industry, Mines and Energy, Department of Mineral Resources Development;
- India—Indian Bureau of Mines;
- Indonesia—Central Bureau of Statistics;
- Japan—Ministry of Economy, Trade and Industry, Research and Statistics Department;
- Republic of Korea—Korea Institute of Geoscience and Mineral Resources;
- Laos—Ministry of Industry and Handicraft, Department of Geology and Mines;
- Malaysia—Ministry of Natural Resources and Environment, Minerals and Geoscience Department;
- Mongolia—Mineral Resources and Petroleum Authority;
- Nepal—Ministry of Industry, Commerce and Supplies, Department of Mines and Geology;
- Pakistan—Ministry of Petroleum and Natural Resources;
- Sri Lanka—Geological Survey and Mines Bureau;
- Thailand—Ministry of Industry, Department of Primary Industries and Mines; and
- Vietnam—Vietnam Institute of Geosciences and Mineral Resources.

For key economic data—

- Asian Development Bank in Manila, Philippines;
- International Monetary Fund in Washington, DC; and
- The World Bank in Washington, DC.

For exploration and other mineral-related information—

- Australian Bureau of Statistics in Canberra, Western Australia, Australia; and
- Metals Economics Group in Halifax, Nova Scotia, Canada.

General Economic Conditions

According to the World Bank, the East Asia and Pacific region (which includes Burma, Cambodia, China, East Timor, Indonesia, Japan, the Republic of Korea, Laos, Malaysia, Mongolia, the Pacific Islands, Papua New Guinea, the Philippines, Singapore, and Thailand) accounted for about 20% of total global economic growth in 2011. Economic growth varied greatly among countries, however, and regional growth decreased to 8.2% compared with 9.7% in 2010 (World Bank, The, 2012a, p. 1).

Slower economic growth in the East Asia and Pacific region was attributed, in part, to spillovers from the lingering financial crisis in the euro area, the adverse economic effects of natural disasters in Japan and Thailand, and a decrease in demand for Chinese products from China's largest export markets (World Bank, The, 2012a, p. 1–3). In 2011, the continuing economic crisis in the euro area centered around bailout packages for Greece and Portugal; the purchase of Italian and Spanish Government bonds by the European Central Bank; and economic growth in the euro area of just 0.2% in the second half of the year. The World Bank predicted that the financial crisis in the euro area would ease, but also that uncertainty regarding crude oil prices and relatively weak demand from high-income countries for imports from Asia, combined with

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China's relatively decreased growth, were expected to diminish GDP growth in the East Asia and Pacific region to 7.6% in 2012 before increasing to 8.1% in 2013 followed by GDP growth of 7.9% in 2014 (World Bank, The, 2012a, p. 1–3; BBC News, 2013).

The GDP growth in East Asia and Pacific countries outside of China decreased to 4.5% in 2011 compared with 7% in 2010. The decrease was owing in part to the downturn in the trade of goods and, in some cases, the adverse terms of trade brought on by high oil prices, which increased by 32% in 2011 compared with the average level in 2010. Demand for exports from the East Asia and Pacific region (in terms of year-on-year growth rates) was expected to increase to 11.4% by 2014 compared with 9.9% in 2011 if exports from the region to the euro area were to stabilize and were to increase to other regions of the world. The reversal of some regional stimulus measures that were introduced in 2011, as in China, could result in decreased demand (World Bank, The, 2012a, p. 1–2, 7; 2012b, p. 50).

Mongolia's accelerated economic growth rate of 17.5% in 2011 was unprecedented for the country, and the unemployment rate decreased to 9% compared with 13% in 2010. Real wages for unskilled workers, however, had begun to decrease, and the inflation rate reached 11.1% by yearend. Mongolia's increasing inflation rate was mostly owing to mineral commodity revenue fueled by Government spending, which increased by 56% in 2011 compared with that of 2010 and which was expected to increase by an additional 32% in 2012. Government spending increases mainly reflected pre-election year pressures, and a large portion of the spending was directed towards cash handouts to citizens and increased capital expenditures. A continuation of the euro area debt crisis or other international economic disturbances that could affect the Asian economies could result in decreased prices for mineral commodities and a subsequent decrease in Government revenues in Mongolia. Such an effect would make the current levels of Government spending in Mongolia unsustainable and would put the country at risk of another boom-and-bust economic trend similar to that which the country experienced in the early- to mid-2000s when commodity prices were high (World Bank, The, 2012c).

In fact, high domestic inflation and declining commodity prices towards the end of the year resulted in the depreciation in the Mongolian currency by 11% during 2011, and the trade deficit reached a record $1.7 billion by yearend as imports of mining-related equipment and fuel imports surged. Exports, however, increased to $4.8 billion compared with $2.9 billion in 2010, supported almost entirely by coal shipments to China. Mongolia's current account deficit increased to 35% of the GDP from 14% in 2010 but was fully funded by record foreign direct investment inflows of $5.3 billion. The rate of growth of the mining and manufacturing sectors was 8.7% and 16%, respectively, during 2011 compared with that of 2010. The transportation and construction sectors grew by 1.6% and 0.2%, respectively, in 2011, but both sectors contracted significantly in the fourth quarter. The construction sector's rate of growth decreased sharply to -20.5% in the fourth quarter compared with the same period in 2010, following an increase of 66.9% in the third quarter of 2011. Those performance statistics led to concerns that a bubble could be forming in the construction sector, especially because of the significant share of bank lending that it received (World Bank, The, 2012c, p. 5–7).

The development of Mongolia's construction sector was seen as vital to the country's economy. The transportation infrastructure required by the mining industry was expected to facilitate growth in other industries that are required to prevent declining performance among non-mineral industries. The Government, therefore, planned to launch an infrastructure development project to boost broad-based economic growth. If successfully implemented, 95% of the Mongolian road network would be paved by 2016.

In South Asia (a World Bank regional designation that includes the countries of Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka), GDP growth decreased sharply in the second half of 2011, and the year ended with an estimated 7.1% growth compared with 8.6% rate of growth in 2010. Monetary policy reforms in India, energy and infrastructure constraints across the region, political and security uncertainties, and fiscal and inflation concerns resulted in decreased industrial activity and foreign investment in the region. In India, which was by far the region's largest economy, economic growth decreased by 3.2% compared with that of 2010. The trade balances and current accounts of South Asian countries were negatively affected by weaker demand for exports as a result of the euro area sovereign debt crisis and adverse terms of trade from elevated international crude oil prices. Inflationary pressures, despite a brief period of easing in India in early 2012, remained high in the region and resulted in depreciation of currencies (World Bank, The, 2012b, p. 49).

According to the World Bank, GDP growth in South Asia was expected to decrease to 6.4% in 2012 (partly because of carryover from significant decreases in the second half of 2011) and then increase to about 6.5% and 6.7% in 2013 and 2014, respectively. India was expected to have a slight increase in growth to nearly 7.0% in fiscal year 2013 (India's fiscal year is from April 1 to March 31), and 7.2% and 7.4% in fiscal years 2014 and 2015, respectively. In Pakistan, growth was expected to increase to 3.8% and 4.1% in fiscal years 2013 and 2014, respectively (Pakistan's fiscal year is from July 1 to June 30). In Bangladesh, GDP growth had seen a modest decline in 2011 to 3.0% from January through December but was expected to increase to 6.4% and 6.5% in fiscal years 2013 and 2014, respectively (Bangladesh's fiscal year is from July 1 to June 30). Trade and industrial production in South Asia began to recover in early 2012, but regional industrial production decreased to 10.3% in the second quarter of fiscal year 2012 from 18.8% in the first quarter. Regional export and import volumes increased by 22.6% and 40.3%, respectively, in the 3 months ending in February but decreased to 13.1% and 2.5%, respectively, by April (World Bank, The, 2012a, p. 49–50).

Electricity shortages and infrastructure constraints across much of the South Asia region affected the private sector and resulted in increased costs to businesses. A gap between installed electrical capacity and demand ranged from 10% in India to nearly 30% in Nepal. Electricity generation companies in Bangladesh, India, and Pakistan often lacked reliable access to inputs. In India, the dominance of state-owned enterprises in coal extraction and underinvestment in capacity expansion,

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among other factors, kept production below demand. The cost of imported crude oil used for power generation in Bangladesh increased and the supply of natural gas in Pakistan remained sporadic. Limited supply forced both public and private power generation companies to ration output, which in turn cut into production levels and exports and could negatively affect long-term growth potential in the region (World Bank, The, 2012a, p. 54).

In March 2011 in Japan, the magnitude 9.0 Tohoku earthquake off the country's east coast triggered a 10-meter tsunami, which reached the Sendai region of the eastern coast of Japan within minutes. The combined natural disasters resulted in about 16,000 confirmed deaths and thousands of missing individuals; about 275,000 homes that were partially or totally destroyed; and a series of power failures, reactor meltdowns, and release of radioactive materials at the Fukushima Daiichi nuclear reactor. In addition, another 11 nuclear reactors were affected by the earthquake.

In the past 100 years, there had been nine earthquakes in Japan that killed more than 1,000 people. The magnitude 6.5 Hanshin earthquake in 1995, which devastated the city of Kobe, and the Tohoku event were among the top three events in terms of casualties. The Hanshin disaster resulted in 6,400 deaths and about 241,000 destroyed homes. Although the Tohoku earthquake was 178 times stronger than the Hanshin earthquake, which struck directly under a large urban area, damage to physical capital was similar for the two events. Damage to physical capital from the Hanshin earthquake accounted for about 0.8% of the total national physical capital stock at the time compared with 1% for the Tohoku earthquake (Drysdale, 2011; Schnell and Weinstein, 2012, p. 2–3).

In the quarter leading up to each of the Hanshin and the Tohoku earthquakes, quarterly GDP growth was similar; the contracted quarterly growth rates were -1.03% and -1.69% for the Hanshin and Tohoku events, respectively, but the recovery was faster after the 1995 disaster. GDP growth was about 1% higher in the quarter following the Hanshin earthquake than in the quarter following the Tohoku disaster. The Nikkei 225 (a stock market index for the Tokyo Stock Exchange) indicated that the value of stocks was down by 4.3% at 3 weeks after the Hanshin earthquake and by 6.9% at 3 weeks after the Tohoku earthquake. Although the Sendai region is less important to the country economically and industrially than Kobe, the country's Industrial Production Index decreased more sharply following the Tohoku disaster, and industrial production recovered more slowly. Also, although industrial production had returned to pre-quake levels within 1½ months after the Kobe earthquake, industrial production was only at 96% of pre-quake production 9 months after the Tohoku disaster (Drysdale, 2011; Schnell and Weinstein, 2012, p. 3).

A rapid increase in the country's Corporate Goods Price Index coupled with decreasing output indicated a dramatic contraction in the supply of goods after the Tohoku earthquake compared with that of the Hanshin earthquake. Many upstream industries were located in the areas affected by the Tohoku event, but supply chain disruptions were not thought to be responsible for Japan's continued low output, as production rebounded nearly uniformly across the country (83% of firms in unaffected areas and 80% of firms in affected areas were producing at or above pre-quake levels by June 2011) (Drysdale, 2011; Schnell and Weinstein, 2012, p. 8).

Energy production in Japan, however, not only decreased in the month of the disaster, but continued to decrease throughout the year. Although only 11 of Japan's 54 nuclear powerplants were directly affected by the Tohoku earthquake and tsunami, communities around the country refused to let reactors that were closed for routine maintenance be restarted. As a result of the public opposition, only three nuclear reactors were functioning as of early 2012. Before the Tohoku earthquake, Japan obtained at least one-quarter of its electricity from nuclear powerplants, so that apart from supply chain dynamics, the changing energy portfolio of the country had, therefore, negatively affected production and economic recovery after the Tohoku earthquake compared with the Hanshin earthquake (Drysdale, 2011; Schnell and Weinstein, 2012, p. 7).

Legislation

During 2011, a number of laws were enacted by the Australian Parliament. Effective as of July 2012, a carbon tax of about $24 per metric ton of carbon was to be imposed on 300 companies that were determined to have the largest carbon emission rates. Legislation would be enacted in July 2012 to expand the definition for minerals exploration to include geothermal energy sources. Updating the tax law by expanding the definition of exploration was intended to ensure that exploration for geothermal energy received the same treatment as traditional hydrocarbon energy sources. A proposal for a 30% mineral resource rent tax (a tax on profits generated from mineral resource revenues) passed the lower house of Parliament but had not passed the upper house by yearend 2011. Under the proposed tax, the Federal Government would refund State royalties to the mining companies (Engineering & Mining Journal, 2011a; Grubel, 2011; Swanepoel, 2011a).

The Australian States of New South Wales and Western Australia had proposed to increase mineral royalty rates to compensate for anticipated job losses to the States when the Federal carbon tax is enacted. The government of the State of Queensland drafted interim legislation to restrict mineral exploration activities within a 2-kilometer buffer area surrounding urban areas with a population greater than 1,000, but provided local jurisdictions the option to exempt themselves from this legislation. The government of the State of South Australia amended provisions of the Mining Act of 1971 that changed the mineral exploration application and assessment process; implemented programs for environmental protection, compliance, and enforcement; and modified landowner-related rights and obligations. The government of South Australian also enacted legislation that would prohibit mining in the Arkaroola region but would open the Woomera area to development (Engineering & Mining Journal, 2011a, b; Swanepoel, 2011b–e).

In 2011, the Mongolian Parliament extended a ban on issuance of new mining exploration licenses, and a Mongolian court ordered the Government to enforce a ban on mining in forest and river areas. A new two-tier royalty plan was passed by the Parliament in 2010 and went into effect on January 1, 2011. Under this plan, exported minerals are assessed a surtax

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royalty in addition to a flat 5% royalty rate. For minerals other than copper, the surtax varies from 1% to 5%, depending on metal prices. The surtax on copper ranges between 22% and 30% for ore, between 11% and 15% for concentrates, and between 1% and 5% for final products. India's Forest and Environment Ministry had implemented regulations requiring all Government-owned mining companies to adopt a Corporate Environmental Policy. Similar regulations were to be applied at a later time to companies operating in the private sector (Das, 2011; Hogan Lovells, 2011; Thomson Reuters, 2011).

The Government of Afghanistan drafted a labor policy that set the minimum age for coal mine workers at 18. The guidelines were scheduled to be implemented in late 2011, and mining inspectors would be employed to ensure that the rules were upheld. Child labor was widespread in Afghanistan, and about 200 children were found to be working in coal mines in central Bamyan Province. Thirty years of conflict has pushed impoverished families to allow children to work in mines. Child labor was also used in small operations, such as cement production. The Government was undertaking a privatization and licensing program for four of its mineral prospects in 2011. They were the Badakhshan gold project in Badakhshan Province, the Balkhab copper project in Sar-e Pul and Balkh Provinces, the Shaida copper project in Herat Province, and the Zarkashan copper-gold project in Ghazni Province. The Government set a deadline of March 9, 2012, for the submission of expressions of interest in these projects. The tender process for each project was expected to result in the granting of a mining agreement and associated exploration license.

Exploration

Exploration activity in much of the Asia and the Pacific region increased in 2011 compared with that of 2010. Data from the Metals Economics Group (MEG)[1] suggest that the 2011 proposed budget allocations for Australian nonfuel mineral exploration activity increased by 35% to about $2 billion in 2011 compared with that of 2010. The 2011 exploration budget allocation for the Pacific region and Southeast Asia (excluding Australia) was about $1 billion, which was a 39% increase compared with that of 2010. China maintained its 4% share of the total exploration budget in 2011 (excluding exploration activity conducted by Government-owned entities) (Metals Economics Group, 2011).

The Australian Bureau of Statistics reported mineral exploration expenditures (excluding coal and petroleum) for fiscal year 2011 (the Australian fiscal year begins on July 1 and ends on June 30) of about $2.4 billion, which is a 40% increase in the Australian expenditure for fiscal year 2011. The Western Australia Department of Mines and Petroleum reported that the number of prospecting licenses in Western Australia increased by about 1% from fiscal year 2010 to fiscal year 2011, and that the number of exploration licenses increased by 14% in fiscal year 2011 compared with that of fiscal year 2010. The Australian statistics include expenditures for a greater number of mineral commodities than do the MEG statistics (Australian Bureau of Agricultural and Resource Economics and Sciences, 2011a; Geoscience Australia, 2012; Western Australia Department of Mines and Petroleum, 2012, p. 5).

The estimated expenditures for iron exploration in Australia accounted for 27% of the total Australian expenditure for metals and minerals exploration for fiscal year 2011 (excluding coal and petroleum). Exploration for gold and iron each accounted for about 27% of the total Australian expenditure for metals and minerals exploration for fiscal year 2011. In nominal terms, the amount budgeted for gold exploration increased by about 13% in fiscal year 2011 to $657 million. The estimated expenditure for copper exploration increased by 60% to $326 million in fiscal year 2011; exploration expenditures for nickel and cobalt increased by 33% to $273 million; exploration expenditures for lead, silver, and zinc increased by 46% to $77 million. Western Australia's share of the Australian mineral exploration expenditure accounted for 54%; Queensland accounted for about 22%; South Australia accounted for about 9%; the Northern Territory accounted for 7%; New South Wales accounted for 5%; Victoria accounted for 2%; and Tasmania accounted for 1% (Geoscience Australia, 2012; Western Australia Department of Mines and Petroleum, 2012).

Of the 182 nonfuel mineral exploration and development projects considered by the Australian Bureau of Agricultural and Resource Economics and Sciences between October 2010 and April 2011, 35 projects (19%) were under construction or committed for development and 147 projects (81%) were at an earlier stage of activity and listed as uncommitted for development. Of these latter projects, 34 were being considered for gold projects; 31 were being considered for iron; 17 were being considered for nickel; 16 were being considered for lead, silver, and zinc; 14 were being considered for copper; 7 were being considered for mineral sands; and 5 were being considered for bauxite. The remaining 23 uncommitted projects considered in this Australian Government assessment were for rare-earth elements, tin, vanadium, and other mineral commodities. The Australian States and Territories with the highest levels of exploration activity in 2011 were, in descending order of the number of sites compiled for this annual review, Western Australia (52%), Queensland (13%), New South Wales and South Australia (10% each), the Northern Territory (9%), and Tasmania and Victoria (3% each) (Australian Bureau of Agricultural and Resource Economics and Sciences, 2011b, p. 17).

Based on MEG data, Indonesia, Papua New Guinea, and the Philippines together accounted for about 80% of the total mineral exploration budget for the Southeast Asia and Pacific Ocean Islands region when Australia is excluded. The increase in this region can be attributed to continued interest by companies from China and the Republic of Korea to expand sources of supply for strategic minerals, such as base metals, gold, and rare-earth elements, and by companies from Japan to develop regional copper and nickel deposits to supply Japan's smelting industry. There is also increased interest among international companies in exploring for undersea minerals in the Pacific Ocean. Based on the data compiled by the USGS on

[1]Metals Economics Group (MEG) data for 2012 included exploration budgets for 20 mineral commodities (including copper, gold, lead, lithium, nickel, niobium, phosphate, potash, rare-earth elements, silver, tantalum, uranium, and zinc) from companies with exploration budgets of $100,000 and greater, which MEG estimated covers between 90% and 95% of world nonferrous, nonfuel mineral exploration budgets.

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active exploration sites, the three countries in the region with the largest number of exploration sites were, in order of exploration sites, Papua New Guinea, the Philippines, and Indonesia, which together accounted for 68% of the active exploration sites in the region. Other countries with active exploration in 2011 included Fiji, Java, the Republic of Korea, Laos, Malaysia, New Caledonia, New Zealand, and the Solomon Islands. Gold and silver exploration accounted for approximately 68% of all exploration interest in the Pacific region, base metals accounted for about 27%, iron and PGM each accounted for about 1%, and other minerals accounted for 3% of the reported activity in 2011. At two-thirds of the sites, companies were conducting early-stage exploration, and at one-third of the sites, they were conducting advanced exploration or were exploring for minerals adjacent to producing mines (Takemoto, 2008; Metals Economics Group, 2011).

Since 2008, the region's share of the world exploration budget has generally increased whereas its share in terms of the number of active exploration sites as compiled by the USGS has decreased. This trend is perhaps reflective of the increased interest by China in exploring for resources in the region. Unlike Africa, where Chinese interests have been working at the national level to secure an adequate supply of resources primarily through trade agreements, Chinese interests in the Pacific are working to secure access to future resources by establishing joint-venture agreements to develop selected advanced deposits. Thus, a greater amount of the regional exploration budget is funding the development of a small number of deposits (Metals Economics Group, 2011).

Cambodia issued 24 mineral resource exploration licenses to local and foreign companies in 2011. Indonesia was conducting a review of more than 8,000 existing mining permits to ensure compliance with new environmental legislation (Nathalia, 2011; People's Daily Online, 2012).

Based on site data compiled by the USGS, exploration activity in Asia in 2011 primarily focused on gold (40% of all sites in this group had gold as the primary commodity); copper (13%); uranium (10%); rare earths (8%); diamond, iron, and silver (6% each); and other mineral commodities (11%).

In an effort to supply its growing industry with raw materials, China opened its mining sector to foreign investment during the 1990s, extended its search for minerals by investing in foreign exploration and development projects during the past decade, and received approval to conduct deep-sea mineral exploration activities in the Indian Ocean in 2011. Domestically, the Chinese Government had announced plans to consolidate and modernize its mining operations. The Chinese mineral industry is dominated by state-owned enterprises, and regional governments issue most exploration and development licenses. In 2011, 23 private foreign companies were conducting mineral exploration in China. Chinese interests continued to explore outside of China for raw materials. MDM Engineering (an Africa-focused mine exploration and development company) reported that 40% of its 2011 projects were funded in some form by the Government of China (Creamer, 2011; McCrae, 2011; Wheeler, 2011).

Commodity Overview

Estimates for the production of major mineral commodities for 2011 and beyond have been based upon supply-side assumptions, such as announced plans for increased production/new capacity construction and bankable feasibility studies. The outlook tables in this summary chapter show historic and projected production trends; therefore, no indication is made about whether the data are estimated or reported, and revisions are not identified. Data on individual mineral commodities in tables in the individual country chapters are labeled to indicate estimates and revisions. The outlook segments of the mineral commodity tables are based on projected trends that could affect current producing facilities and on planned new facilities that operating companies, consortia, or Governments have projected to come online within indicated timeframes. Forward-looking information, which includes estimates of future production, exploration and mine development, the cost of capital projects, and timing of the start of operations, are subject to a variety of risks and uncertainties that could cause actual events or results to differ significantly from expected outcomes. Projects listed in the following section are presented as an indication of industry plans and are not a USGS prediction of what will take place.

Metals

Aluminum and Bauxite and Alumina.—World primary and secondary aluminum production increased by about 13.5% to 56.5 million metric tons (Mt) in 2011 compared with that of 2010 owing to smelter reopenings and expansions as prices recovered from the lows during the financial crisis of 2008 to 2009. Asia's production of aluminum increased by 9.4% in 2011 to 26.8 Mt compared with that of 2010. China accounted for 82.8% of the regional total and was the world's leading producer of aluminum, accounting for 39.2% of the total, followed by Australia (7.7% of regional production and 3.7% global production) and India (6.2% of regional production and 3% of global production) (tables 4, 6).

In Australia, aluminum was produced at Alcoa of Australia's Point Henry and Portland smelters in Victoria, Hydro Aluminium Kurri Kurri Pty. Ltd.'s Kurri Kurri smelter in New South Wales, and Rio Tinto Alcan's Bell Bay smelter in Tasmania, as well as the Boyne Island smelter in Queensland and the Tomago smelter in New South Wales. Smelter shutdowns in Australia were announced in early 2012 because of the cost of power generation, low aluminum prices, and costs associated with proposed regulations on emissions of greenhouse gases in the country.

In China, the Government announced a policy to permanently shut down 600,000 metric tons per year (t/yr) of primary aluminum capacity that used obsolete technology. The stated purpose of the policy was to remove the least efficient potlines, limit energy consumption, reduce pollution emissions, and reduce oversupply. The closures were expected to be offset by new smelters and expansions. Approximately 270,000 t/yr of aluminum smelter capacity was specifically identified for elimination in Hubei, Shaanxi, Henan, and Qinghai Provinces. Several Chinese Government agencies took action to stop construction of 23 aluminum smelter projects, which would

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have had a combined capacity of 7.74 million metric tons per year (Mt/yr). The action was taken to prevent overcapacity of aluminum smelters as well as to limit power consumption and pollution (Bray, 2012a, p. 5.5).

In India, the National Aluminium Co. Ltd. (Nalco) temporarily shut down 10% of the capacity at its 460,000-t/yr Angul smelter. Shortages of coal for its powerplant and decreasing aluminum prices were cited as reasons for the shutdown. Nalco expected to complete upgrading smelting pots in 2012 that would increase capacity to 560,000 t/yr. Vedanta Resources plc was upgrading the capacity at the Jharsuguda I smelter to 550,000 t/yr with a project scheduled for completion by the end of June 2013. Bedanta was progressing on construction of the 1.25-Mt/yr Jharsuguda II smelter, and completion was expected by yearend 2013. Construction of the 325,000-t/yr Korba III smelter was progressing, and initial production was expected in the fourth quarter of 2012. Other smelter expansions that were either completed or expected to be completed by Hindalco Industries Ltd. would add at least 1.14 Mt/yr of additional smelter capacity by 2015 (Bray, 2012a, p. 5.6).

The damage that resulted from the earthquake and tsunami at the Daiichi nuclear plant in Japan had an effect on aluminum consumption by the domestic automotive industry. Although primary aluminum production in Japan was not affected substantially, the loss of power and the damage to factories and infrastructure forced the closure of several automobile parts manufacturers in Japan. The shortage of parts from Japan forced some assembly lines in Japan and the United States to close or slow production for several months, which resulted in decreased consumption of secondary aluminum in China by automobile parts manufacturers. In the Republic of Korea, Novelis Inc. announced that it would expand its recycling facility and rolling mill in Yeongju. The expansion of the recycling facility would increase capacity by approximately 220,000 t/yr by yearend 2012. The expansion of the rolling mill was expected to be completed in late 2013 (Bray, 2012a, p. 5.7).

In 2011, world production of bauxite increased by 16.7% compared with that of 2010. Asia's production of bauxite increased by 25.8% in 2011 to 166 Mt compared with that of 2010. Australia's production of bauxite accounted for 42% of the regional and 27.8% of the world total in 2011; Australia was the world's leading producer of bauxite, followed by China (27.1% of regional production and 17.8% of global production) and India (6.2% of regional production and 4.1% of global production) (tables 4 and 5).

In Australia, bauxite was mined at the Gove Mine in the Northern Territory; the Weipa Mine in the northern part of Queensland; and the Huntly, the Willowdale, and the Worsley Mines in Western Australia. All Australia's alumina refineries were located in close proximity to their bauxite mines and shipping facilities. Western Australia remained the leading bauxite-producing State and accounted for about 60% of the country's total output of bauxite followed by Queensland (30%) and the Northern Territory (10%). Owing to increasing demand for alumina in China in recent years, Australian producers expanded the output capacities of their bauxite mines and alumina refineries.

Rio Tinto Alcan was conducting a feasibility study and an environmental impact study to develop the bauxite resource in an area south of Embley River and the existing Weipa Mine. The new operation would progressively replace depleted resources at the Andoom and the East Weipa mining areas in Weipa and extend production of bauxite deposits in the area by 40 years. The new development would increase output capacity to 50 Mt/yr from the current capacity of 21 Mt/yr in the region south of the Weipa Peninsula. Construction of a bauxite mine was scheduled to begin in 2012, depending on regulatory and internal company approvals. The first shipments were expected to be in 2016. In 2011, bauxite production at the Weipa Mine increased by 9% to meet the demand from a third party. The production of alumina decreased by 4% because of abnormally heavy rains in Queensland during the first quarter of 2011.

In China, Guangdong Galuminium Group Ltd. completed an 800,000-t/yr alumina refinery in Qingzhen, Guizhou Province, which started production in December. The company was also developing a mine at a nearby bauxite deposit to supply the refinery. The mine would have a capacity of 1.6 Mt/yr when completed at the beginning of 2012. China Power Investment Corp. (CPI) started construction of a bauxite mine in Wanchangping, Guizhou Province. The mine would produce 1 Mt/yr of bauxite that would supply a 1-Mt/yr alumina refinery being constructed in Wuchuan, Guizhou Province. CPI started construction of a 1-Mt/yr bauxite mine at Dazhuyuan, Guizhou Province, also to supply the Wuchuan alumina refinery (Bray, 2012b, p. 10.3).

Shanxi Tongde Aluminum Co. Ltd. started construction of a 1-Mt/yr alumina refinery in Yangjiawan, Shanxi Province. Further expansion of the refinery to 2.8 Mt/yr was planned, and a 6-Mt/yr bauxite mine and 1-Mt/yr aluminum smelter were planned as part of the project. A completion schedule was not available. Yunnan Aluminum Co. Ltd. completed its 800,000-t/yr alumina refinery in Wenshan, Yunnan Province, late in 2011 but delayed startup until 2012 owing to technical issues. Production of bauxite from the nearby mine started in August (Bray, 2012b, p. 10.3).

Citing limited, low-quality bauxite reserves in China, the Chinese Government was funding research on recovering alumina from coal ash. Two refineries were reportedly being constructed to recover alumina from coal ash as part of the program. Datang International China Coal Corp. was constructing a 100,000-t/yr alumina refinery in Pingsu, Shanxi Province, to be completed in the second half of 2012, with further expansions possible. In addition to the projects which were part of the research program, in December, Shenhua Group Corp. Ltd. started construction of a refinery to recover alumina from coal ash in Jungar Banner, Inner Mongolia Autonomous Region. The refinery capacity was expected to be 1 Mt/yr, and further expansions were proposed (Bray, 2012b, p. 10.3)

In Indonesia, PT Aneka Tambang (Antam) started construction of a 300,000-t/yr chemical-grade alumina refinery at Tayan, West Kalimantan. The project was a joint venture between Antam (80%) and Japan-based Showa Denko K.K. (20%). Bauxite for the refinery was to come from a nearby deposit that was being developed. The refinery was expected to begin production in early 2014. Antam also planned to

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construct a smelter-grade alumina refinery in Mempawah, West Kalimantan, and was exploring for bauxite in several prospects nearby (Bray, 2012b, p. 10.4).

In Vietnam, state-owned Vietnam National Coal and Mineral Industries Group (Vinacomin) was progressing toward opening a 600,000-t/yr alumina refinery in Tan Rai, Lam Dong Province. Construction had been scheduled for completion in September, but heavy rainfall delayed completion until December. Commissioning of the refinery was completed in April 2012. Tan Rai would be Vietnam's first alumina refinery and would use bauxite from adjacent deposits. Alumina from the refinery was to be sold to customers in China, such as Aluminum Corporation of China (Chinalco), which was providing technical support in the construction of the refinery, and in other countries. Mining of bauxite from a deposit adjacent to the refinery started during 2011. Vinacomin was also building a 650,000-t/yr alumina refinery in Nhan Co, Dak Nong Province, which was to be completed in 2013 (Bray, 2012b, p. 10.5).

Copper.—The region's production of mined copper accounted for 20.8% of the world total in 2011 compared with 21% in 2010. China was the leading regional producer followed by Australia and Indonesia. Mined copper production increased modestly in 2011 compared with that of 2010 in India (15.2%), Australia (12.8%), the Philippines (10.3%), and China (9.5%), whereas it decreased significantly in Indonesia (by72%) and Papua New Guinea (by18.8%). Between 2011 and 2018, regional production of mined and refined copper was expected to continue to increase at an average annual rate of 7.3% and 1.8%, respectively. This estimation was based on reported capacity expansions of mined copper in Australia, China, India, Mongolia, the Philippines, and Vietnam, and on reported capacity expansions of refined copper in China, India, Indonesia, and Japan (tables 4, 7, 8).

Indonesia's mined copper production decreased owing to lower ore grades at United States-based Freeport-McMoRan Copper and Gold Inc.'s Grasberg Mine. Mined copper production also decreased in Papua New Guinea owing to decreased ore grades at the Ok Tedi Mine (owned by National Papua New Guinea Sustainable Development Program Ltd. and the Government of Papua New Guinea) and because of shutting down of the mill on two occasions during the year.

Mongolia's mined copper production decreased slightly by 2.4% in 2011 compared with that of 2010, but a sixfold increase in annual production was projected by 2014 compared with that of 2011. This growth was projected to come almost completely from the Oyu Tolgoi project, which had estimated total reserves and resources of 3.5 billion metric tons (Gt) containing 30.6 Mt of copper and 1.02 million kilograms of gold. Oyu Tolgoi was jointly owned by Turquoise Hill Resources Ltd. of Canada (66%) (previously known as Ivanhoe Mines Ltd., which was 51% owned by Rio Tinto plc) and the Mongolian Government (34%). The operation was expected to start up in 2013 (Rio Tinto plc, 2013, p. 7, 51; Ivanhoe Mines Ltd., 2012, p. 13–17).

In China, CNMC Fubang Copper Industry Co. Ltd. completed the construction of its 100,000-t/yr copper blister plant in Linxi County, Nei Mongol Autonomous Region. The blister copper would be shipped to its 60,000-t/yr copper refinery to be refined. Sichuan Hongda Co. Ltd. announced that the company would invest $1.6 billion to build a multimetal complex at Shifang Economic Development Zone in Shifang City, Sichuan Province. The complex would hold a 400,000-t/yr refined copper plant and a 40,000-t/yr molybdenum plant. In the first phase of construction, a 200,000-t/yr refined copper plant, 25,000-t/yr ferromolybdenum plant, and 7,500-t/yr molybdenum oxide plant would be built. The Ministry of Environmental Protection approved the environmental impact study. Shandong Dongying Fangyuan Nonferrous Metals Co. Ltd. was scheduled to complete its second 200,000-t/yr copper refinery in 2012. Fangyuan's refined copper capacity would increase to 400,000 t/yr.

Gold.—China and Australia ranked first and second in the world production of gold, and accounted for 13.5% and 9.7%, respectively, of global production. Production of mined gold in the countries of the Asia and the Pacific region accounted for 32.1% of the world total in 2011 compared with 33.8% in 2010. Regional gold production in 2011 decreased by 0.8% compared with that of 2010. China was the leading mined-gold-producing country in the region and accounted for 42.2% of regional production; it was followed by Australia (30.3%), Indonesia (11.2%), and Papua New Guinea (7.2%). The decrease in the region's contribution to global gold production was owing, in part, to a 9.6% decrease in production in Indonesia, which appeared to be caused by a cessation of production at the North Lanut Mine as Avocet Mining plc of the United Kingdom completed the sale of the operation. The largest decreases in terms of volume were in the Philippines (23.8%) and Laos (21.3%), each of which, however, accounted for only 3.6% and 0.4%, respectively, of regional production. The largest increase was in China (17,000 kilograms). Regional production of mined gold was expected to increase by about 29% by yearend 2018 compared with that of 2011 (tables 4 and 9; Avocet Mining plc, 2011).

Australian gold production was expected to increase by 7.7% by 2014. Crocodile Gold Corp. of Australia's Cosmo Deep Mine, Regis Resources Ltd. of Australia's Duketon Mine, and Anglo Gold Ashanti Ltd. of South Africa's Tropicana Joint Venture project were all expected to be brought onstream during the next 2 years. In China, gold production was expected to increase by 10.5% by 2014 compared with that of 2011 and to continue to increase gradually. Many of China's gold mines had relatively high production costs and were small in scale. Gold production in Mongolia was expected to increase because of access to exceptionally high-grade ore from the Oyu Tolgoi copper-gold mine, and output was expected to remain steady after 2013. The increase in gold production in Papua New Guinea was dependent upon whether the Frieda River Mine and the Yandera Mine are put into operation.

The region was the world's major market for gold and accounted for about 57.6% of the world's total gold consumption in terms of value in 2011 compared with 59% in 2010. India was the world's leading consumer of gold, accounting for about 26% of the world total. Owing to continuing strong economic growth, China was the second ranked gold consumer, and its share of the world total increased to about 23% compared with 19% in 2010. The total gold demand from China and India, however, decreased to about 1,750 metric tons (t) in 2011 compared with more than 2,000 t

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in 2010. The decrease in consumption in the Asia and the Pacific region was attributable in part to inflation and monetary tightening in India and subsequent depreciation of the country's currency. China's gold demand reached 82% of that of India in 2011, having exceeded the 50% mark for the first time only in 2009. Gold demand in both countries was expected to remain high in the long term despite potential decreases in the short term.

Iron Ore and Iron and Steel.—The region's production of iron ore was estimated to account for, in terms of gross weight, about 69.7% of the world total in 2011 compared with 67% in 2010. China ranked first in the world in the production of iron ore (in terms of iron content), and Australia and India ranked second and third in the region, respectively, in steel production in the Asia and the Pacific region. Regional production of iron ore was expected to increase at an average annual rate of about 2% between 2011 and 2018. This prediction is based on gradual capacity expansions in Australia, China, and India (tables 4, 10).

The East Asian countries of China, Japan, and the Republic of Korea were among the world's leading consumers and importers of iron ore. Australia was the region's and the world's leading supplier of iron ore. The Republic of Korea's iron ore output increased sharply to meet domestic and regional demand. India, which was China's third ranked iron ore supplier after Australia and Brazil, was expected to remain in that position for the next several years.

The region's production of crude steel was estimated to account for about 64.9% of the world total compared with 64% in 2010. China, which was by far the world's leading producer of crude steel, accounted for about 45.1% of the world total compared with 44.3% in 2010. Japan, India, and the Republic of Korea ranked second, third, and fourth, respectively, in steel production in the Asia and the Pacific region. Regional production of crude steel was expected to increase by 12.8% between 2011 and 2018 (table 11).

In China, after more than 5 years, the NDRC finally gave permission for Baoshan Iron and Steel Group and Wuhan Iron and Steel Group to build two iron and steel complexes in Guangdong Province and Guangxi Zhunagzu Autonomous Region, respectively. Baoshan would invest about $11 billion in the iron and steel project in Zhanjiang, Guangdong. At its designed capacity, the plant would produce 10 Mt of crude steel, 9.4 Mt of steel products, and 9.2 Mt of pig iron. Wuhan would also invest about $11 billion in the iron and steel project at Fangchenggang, Guangxi. That plant would have a designed capacity to produce 9.2 Mt of crude steel, 8.6 Mt of steel products, and 8.5 Mt of pig iron. Currently, China imported about 70% of its high-value-added steel products from overseas. Baoshan planned to produce high-value-added steel products at its Zhanjiang plant to meet domestic customers' demand. Wuhan planned to have its steel products target manufacturing bases for automobiles and home appliances in the southern part of the country and in the countries of Southeast Asia.

Platinum-Group Metals.—The region's production of mined platinum and palladium was insignificant and accounted for less than 1% of the world total in 2010. Jinchuan Nonferrous Metals of China produced platinum and palladium as byproducts of mined nickel from its nickel mining and refining operations at Jinchuan, Gansu Province. Australia was not a primary producer of platinum-group metals (PGM), although small amounts of palladium were produced as a byproduct of nickel operations at Kalgoorlie-Boulder and Kambalda in the State of Western Australia. Regional PGM consumption was expected to increase in the autocatalysts and electronics sectors. The rapid growth in the manufacture of automobiles, light vehicles, computers, and electronic goods in China and India raised the demand for PGM in the region in 2011 (tables 12 and 13).

Tin.—The Asia and the Pacific region was the dominant producer of mined tin and tin metal in the world. Production of mined tin and refined tin accounted for 73.8% and 82.4%, respectively, of the world total in 2011 compared with 70.1% and 80.9% in 2010. China ranked first in the world in the production of mined tin and refined tin and Indonesia ranked second. The combined output of China and Indonesia accounted for about two-thirds of the world's mined tin output. Other significant refined tin producers in the region were Malaysia and Thailand.

Regional production of refined tin was expected to increase by about 6.1% by 2014 compared with that of 2011 and to increase by about another 7.1% by yearend 2018. Owing to depleted tin resources in the region, the production of mined tin was expected to decrease slightly during that period. This estimation was based on reported gradual expansions of capacity and increases in productivity. In Australia, Consolidated Tin Mines Ltd.'s three projects near Cairns were exploration-stage projects in 2011 (tables 14, 15).

Owing to increased domestic demand in China, Indonesia replaced China as the leading tin exporting country, and China became a net importer of tin concentrates. In 2011, Burma accounted for 71.7% of the total imports to China, which was about a threefold increase compared with that of 2010. Indonesia was the leading unwrought tin exporter to China and accounted for 38.6% of China's total tin imports, followed by Malaysia (25.1%), and Thailand.

Tin was one of the Chinese Government's protected commodities. Owing to increased domestic tin consumption, the export volume of tin from China was expected to continue to decrease in the future. Likewise, the Indonesian Government had banned exporting raw material, and as a result, the volume of tin supply from Indonesia to the world market continued to decrease. The principal tin consumption sectors were electronics, glass, iron and steel, and packaging.

Industrial Minerals

Diamond.—The Asia and the Pacific region's production of diamond accounted for an estimated 12.1% of the world total in 2011. Australia was by far the leading diamond producing country in the region and was the third ranked diamond producing country in the world. The quality of diamond from Australia was considered low grade compared with that from Angola, the Central African Republic, Guyana, India, Indonesia, and Sierra Leone. Rio Tinto Australia, which operated diamond mines in Australia, exported most of its diamond output and planned to divest its diamond interests. India was the leading diamond importing country in the region and ranked second in the world behind the European Union (Rio Tinto plc, 2012).

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Lithium.—Lithium is the lightest metallic element and has been widely used in the battery and electronics sectors. Worldwide production and consumption of lithium increased by 17.2% in 2011 compared with that of 2010. Australia was by far the leading lithium producer in the Asia and the Pacific region followed by China. In Australia, Talison Minerals Group's lithium operation, which reportedly is the largest spodumene deposit in the world, is located at Greenbushes in Western Australia. Talison's lithium resource at Greenbushes was 31.4 Mt at an average grade of 3.1% lithium oxide, and the estimated life of the Greenbushes Mine was increased to 22 years. The two ore treatment plants at the facility had a combined total output capacity of 600,000 t/yr to produce about 260,000 t/yr of lithium concentrates that contained about 15% lithium carbonate equivalent (table 17).

In China, Qinghai CITIC Guoan Technology Development Co. Ltd., Tibet Mineral Development Co. Ltd., and Xinjiang Haoxin Lithium Salt Development Co. Ltd. were major lithium producers. High production costs and low recovery rates, however, forced the companies to source raw material from overseas. Australia supplied about 80% of China's lithium demand.

The Government of the Republic of Korea, as part of the effort to secure stable long-term supplies of lithium for its expanding automobile, battery, and electronics industries, partnered with domestic companies, including POSCO Co. Ltd. and SK Energy Co., Ltd., to acquire lithium from a broad range of sources and countries. The Government had signed an agreement with POSCO and the Korea Institute of Geoscience and Mineral Resources to conduct joint research and to build an offshore pilot plant for the commercial production of lithium from seawater. The pilot plant was completed in 2011 and was expected to produce 30 t/yr of lithium carbonate beginning in 2014, with the goal of producing a total of 100,000 t of lithium carbonate by 2020 (Jaskula, 2012, p. 44.6).

Mineral Fuels

Coal.—The region's total production of coal, which included anthracite, bituminous, and lignite, accounted for about 69.8% of the world total in 2011. The region's production of anthracite coal, however, accounted for about 93.2% of the world total, and its production of bituminous coal accounted for about 67.5%. China, which was by far the world's leading producer of anthracite and bituminous coals, accounted for 77.9% and 47.6%, respectively, of the world total. In the Asia and the Pacific region, Australia, India, and Indonesia, and North Korea were also significant producers of the various grades of coal. Overall regional coal production was expected to increase at an average annual rate of about 1.4% between 2011 and 2018. This prediction takes into account planned capacity expansions and newly developed mines (tables 4, 18).

In China, about two-thirds of the country's electricity was produced by coal-fired powerplants and about 50% of the country's total coal output was consumed by the power sector. Although China's coal production continued to increase in 2011 because of an increase in demand for coal by every industrial sector, China became a net coal importing country. Provincial governments in China were urged to provide financial and technological support to coal enterprises to help transform them into more efficient and safe coal producers. A proposed consolidation within the coal sector would lead to 10 large coal enterprises with output capacities of more than 100 Mt/yr and 10 coal enterprises with output capacities of 50 Mt/yr. The number of coal producers would be reduced to about 4,000 by 2015. The top 20 large coal enterprises would account for about 60% of the country's coal output. The average annual production of each coal company would increase to more than 1 Mt from 300,000 t. In 2015, the country would have a coal output capacity of 4.1 Gt, and coal production and consumption would be controlled by Government policy at 3.9 Gt.

Australia was the world's leading exporter of coal. Queensland and New South Wales were Australia's leading coal-producing States and accounted for about 95% of the country's total output. Queensland's coal output accounted for 52.3% of the country's total output and was mainly from the Bowen Basin, which extends south from Collinsville to Blackwater and Moura, and from mines at Blair Athol, Newlands, and near Brisbane. New South Wales' coal output accounted for 45.3% of the country's total output and was mined near the eastern and western edges of the Sydney Gunnedah Basin.

Australia exported more than 280.6 Mt of coal compared with 300.3 Mt in 2010. Japan, which was the leading destination for Australian metallurgical coal, received 30.7% of Australia's metallurgical coal exports, followed by India, 21.8%; the Republic of Korea, 6.7%; China, 5.3%, and others, 35.5%. Japan was also the leading destination for Australian thermal coal and received 44.3%, followed by the Republic of Korea, 20.0%; Taiwan, 12.9%; China, 11.3%; and others, 11.5%. Owing to increased demand from its fellow countries in the Asia and the Pacific region, such as China and India, Australia's metallurgical coal exports were expected to increase during the next several years.

Mongolia hosts about 300 coal deposits and occurrences in 15 basins, about 60% of which are located in the Eastern and Gobi regions. Mongolia's total coal resources include about 9.8 Gt of proven reserves, and the country's still unexploited Tavan Tolgoi deposit contains a reported 6.5 Gt of coking coal. As of early 2011, the initial public offering (IPO) for Tavan Tolgoi was expected to take place on the Hong Kong stock exchange by yearend 2011 or early 2012. The state-owned Erdenes Tavan Tolgoi Co. had planned to retain 50% ownership of the project and would distribute 10% of the shares to Mongolian citizens, 10% to Mongolian companies, and 30% to the IPO. By January 2012, however, after encountering regulatory problems approving the $3 billion IPO in Hong Kong, the Mongolian Government decided to seek an IPO on the London Stock Exchange as well as domestically on the Mongolian Stock Exchange.

Trade Review

During the past three decades, the main source of economic growth in the Asia and the Pacific region has shifted from the export of manufactured goods toward the export of machinery. This shift was initially led by Japan, followed by the newly

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industrialized economies of Hong Kong, the Republic of Korea, Singapore, and Taiwan, and, more recently, by Indonesia, Malaysia, the Philippines, and Thailand. Trade liberalization and investment policy reforms in developing countries in the region have reduced barriers to trade and investment. Both the cross-border transshipment of production components and assembly within the region had increased during the past several years, and the composition of exports was shifted toward intermediate goods. The share of parts and components in manufactured imports also was trending upward in the region. By 2010, the volume of imports of parts and components had more than doubled in China, the Philippines, Thailand, and Vietnam. China had become one of the major export destinations for all economies in the region. Although recent economic policy changes in China were designed to increase domestic consumption, the export value to China from such countries as Malaysia, the Philippines, the Republic of Korea, Singapore, and Thailand increased by almost five times during this period, at the expense of the United States and the European Union.

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TABLE 1
ASIA AND THE PACIFIC: AREA AND POPULATION IN 2011

Country	Area[1] (square kilometers)	Estimated population[2] (thousands)
Afghanistan	652,230	35,320
Australia	7,741,220	22,621
Bangladesh	143,998	150,494
Bhutan	38,394	738
Brunei	5,765	406
Burma	676,578	54,585 [1]
Cambodia	181,035	14,305
China	9,596,961	1,344,130
Fiji	18,274	868
Hong Kong	1,104	7,072
India	3,287,263	1,241,492
Indonesia	1,904,569	242,326
Japan	377,915	127,817
Korea, North	120,538	24,451
Korea, Republic of	99,720	49,779
Laos	236,800	6,288
Malaysia	329,847	28,859
Mongolia	1,564,116	2,800
Nepal	147,181	30,486
New Caledonia	18,575	249
New Zealand	267,710	4,405
Pakistan	796,095	176,745
Papua New Guinea	462,840	7,014
Philippines	300,000	94,852
Singapore	697	5,184
Solomon Islands	28,896	552
Sri Lanka	65,610	20,869
Taiwan	35,980	23,235 [1]
Thailand	513,120	69,519
Timor-Leste	14,874	1,176
Vietnam	331,210	87,840
Total	29,959,115	3,876,477
World total	148,940,000	6,973,738

[1]Source: U.S. Central Intelligence Agency, The World Factbook 2012.

[2]Source: The World Bank, 2012 World Development Indicators Database.

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TABLE 2

ASIA AND THE PACIFIC: GROSS DOMESTIC PRODUCT [1,2]

Country	Gross domestic product in 2011 based on purchasing power parity		Real gross domestic product growth rate (percentage)		
	Gross value (million dollars)	Per capita (dollars)	2009	2010	2011
Afghanistan	29,738	956	20.9	8.2	5.8
Australia	915,098	40,847	1.4	2.7	2.1
Bangladesh	283,469	1,909	5.9	6.4	6.5
Bhutan	4,309	5,836	6.7	8.3	5.3
Brunei	21,033	49,536	-1.8	2.6	2.2
Burma[3]	89,230	1,400	5.1	5.5	6.2
Cambodia	33,819	2,239	-2.0	6.0	7.1
China	11,299,790	8,387	9.2	10.3	9.2
Fiji	4,153	4,643	-1.3	0.3	2.1
Hong Kong	351,473	49,417	-2.7	7.0	5.0
India	4,420,560	3,663	6.8	10.1	6.8
Indonesia	1,124,630	4,666	4.6	6.1	6.5
Japan	4,444,140	34,748	-6.3	4.0	-0.8
Korea, North[3]	40,000	1,800	-0.9	4.0	0.8
Korea, Republic of	1,554,120	31,220	0.3	6.2	3.6
Laos	17,408	2,768	7.6	7.9	8.0
Malaysia	463,689	16,240	-1.6	7.2	5.1
Mongolia	13,292	4,770	-1.3	6.4	17.5
Nepal	38,080	1,249	4.4	4.6	3.9
New Caledonia[4]	3,158	15,000	NA	NA	NA
New Zealand	123,709	28,011	-2.0	1.7	1.3
Pakistan	488,372	2,786	1.7	3.8	3.0
Papua New Guinea	16,863	2,532	5.5	7.0	8.9
Philippines	391,119	4,080	1.1	7.6	3.9
Singapore	314,906	59,710	-0.8	14.5	4.9
Solomon Islands	1,761	3,198	-1.2	6.5	10.7
Sri Lanka	116,333	5,664	3.5	8.0	8.3
Taiwan	875,941	37,716	-1.9	10.9	4.0
Thailand	602,216	9,398	-2.4	7.8	0.1
Timor-Leste[3]	10,630	9,500	12.9	6.1	10.0
Vietnam	299,980	3,359	5.3	6.8	5.9
Total	28,393,019	XX	XX	XX	XX
World total	78,969,780	XX	-0.6	5.1	3.8

NA Not available. XX Not applicable.

[1]Source: International Monetary Fund, World Economic Outlook Database, October 2012.

[2]Gross domestic product listed may differ from that reported in individual country chapters owing to differences in source or date of reporting.

[3]Based on 2011 to 2012 estimates. Source: U.S. Central Intelligence Agency, The World Factbook 2012.

[4]Based on 2003 estimate. Source: U.S. Central Intelligence Agency, The World Factbook 2012.

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TABLE 3

ASIA AND THE PACIFIC: SELECTED EXPLORATION SITES IN 2011[1]

Country	Type[2]	Site	Commodity	Company	Resources[3]
Australia	E	Doolgunna	Au, Ag, Cu	Sandfire Resources NL	474,000 oz Au, 3.75 Moz Ag, 470,000 t Cu (ID).
Do.	P	Frog's Leg	Au	La Mancha Resources Inc.	714,000 oz Au (T).
Do.	E	Lake Giles	Iron ore	MacArthur Minerals Ltd.	323 Mt Fe (IF).
Do.	E	Rannes	Au, Ag	Solomon Gold plc.	79,000 oz Au, 7.9 Moz Ag (IF).
Do.	E	Springfield	Cu, Au	Talisman Mining Corp.	Data not released.
China	P	Jiama	Cu, Au, Ag, Mo, Pb, Zn	China Gold International Resources Corp.	0.89 Mt Cu, 1 Moz Au, 56 Moz Ag, 41,000 t Mo, 85,000 t Pb, 53,000 t Zn (R).
Do.	P	Jinfeng	Au	Eldorado Gold Corp.	3.2 Moz Au (R).
Papua New Guinea	E	Golpu	Cu, Au, Mo	Harmony Gold Mining Company Ltd.	800,000 t Cu, 1.4 Moz Au, 8,500 t Mo (R).

Do. Ditto.

[1]Abbreviations used for commodities in this table include the following: Ag—silver; Au—gold; Cu—copper; Fe—iron ore; Mo—molybdenum; Pb—lead; Zn—zinc.

Abbreviations used for units of measure include the following: Moz—million troy ounces; Mt—million metric tons; oz—troy ounces; t—metric tons.

[2]E—Active exploration; P—Exploration associated with producing site.

[3]Based on 2010 data reported from various sources; ID—indicated; IF—inferred; R—proven + probable; T—total resource.

Resource data not verified by the U.S. Geological Survey.

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TABLE 4

ASIA AND THE PACIFIC: PRODUCTION OF SELECTED COMMODITIES IN 2011[1]

(Thousand metric tons unless otherwise specified)

Country	Metals										
				Copper		Gold, mine output, Au content (kilograms)	Iron and steel			Lead	
	Aluminum			Mine output, Cu content	Refined, primary		Iron ore, gross weight	Pig iron	Steel, crude	Mine output, Pb content	Refined, primary
	Alumina	Bauxite	Metal[2]								
Afghanistan[e]	--	--	--	--	--	--	--	--	--	--	--
Australia	19,399	69,976	2,075	958	477	260,000	488,000 [e]	6,400 [e]	6,538	621	187
Bangladesh[e]	--	--	--	--	--	--	--	--	--	--	--
Bhutan[e]	--	--	--	--	--	--	--	--	--	--	--
Brunei[3]	--	--	--	--	--	--	--	--	--	--	--
Burma	--	--	--	10	10	100 [e]	--	2 [e]	25 [e]	9 [e]	--
Cambodia[e]	--	--	--	--	--	--	--	--	--	--	--
China[e]	34,100	45,000	22,200	1,270	3,390	362,000	1,330,000	640,510 [4]	685,280 [4]	2,400	3,200
Christmas Island	--	--	--	--	--	--	--	--	--	--	--
Fiji	--	--	--	--	--	1,622	--	--	--	--	--
Hong Kong[3]	--	--	--	--	--	--	--	--	--	--	--
India[e]	3,880	10,300	1,667 [4]	38	673	--	240,000 [4]	38,900 [4]	72,200 [4]	115	120 [4]
Indonesia[e]	--	40,000	244 [4]	543 [4]	257 [4]	96,100 [4]	--	--	3,800	--	--
Japan	280 [e]	--	189	--	1,094	8,691	--	81,028	107,601	--	100
Korea, North[e]	--	--	--	12	15	2,000	5,300	900	1,300	13	9
Korea, Republic of	--	--	--	--	595	209	542	42,213	68,519	3	257
Laos	--	--	--	139	79	3,984	--	--	--	3	--
Malaysia	--	188	--	--	--	4,215	7,699	--	5,941	--	--
Mongolia	--	--	--	122	2	5,703	5,678	--	60	--	--
Nauru	--	--	--	--	--	--	--	--	--	--	--
Nepal[e]	--	--	--	--	--	--	--	--	--	--	--
New Caledonia	--	--	--	--	--	--	--	--	--	--	--
New Zealand	--	--	376	--	--	14,324	--	659 [e]	844 [e]	--	--
Pakistan[e]	--	10	--	19	--	--	400	500	1,200	27	--
Papua New Guinea[e]	--	--	--	130	--	62,200	--	--	--	--	--
Philippines	--	--	--	64	164	31,120	--	--	1,200	--	--
Singapore	--	--	--	--	--	--	--	--	NA	--	--
Solomon Islands	--	--	--	--	--	--	--	--	--	--	--
Sri Lanka[e]	--	--	--	--	--	--	--	--	--	--	--
Taiwan	--	--	--	--	--	--	--	12,940	22,879	--	--
Thailand[e]	--	--	--	--	--	2,372 [4]	970	--	4,000	--	--
Vietnam[e]	--	100	--	11	8	3,500	4,168 [4]	800	4,500	7	--
Total	57,700	166,000	26,800	3,320	6,770	858,000	2,080,000	825,000	986,000	3,200	3,870
Share of world total	63%	66%	47%	21%	41%	32%	70%	75%	65%	68%	76%
United States	3,570	NA	5,100	1,110	993	234,000	54,700	30,200	86,400	334	118
World total	91,800	252,000	56,500	15,900	16,600	2,670,000	2,980,000	1,090,000	1,520,000	4,730	5,080

See footnotes at end of table.

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TABLE 4—Continued
ASIA AND THE PACIFIC: PRODUCTION OF SELECTED COMMODITIES IN 2011[1]

(Thousand metric tons unless otherwise specified)

	Metals								
	Manganese ore, mine output,	Mercury, mine output,	Nickel, metal content		Tin (metric tons)		Tungsten, mine output,	Zinc (metric tons)	
Country	Mn content	Hg content (metric tons)	Mine output	Refinery products	Mine output, Sn content	Metal, primary	W content (metric tons)	Mine output, Zn content	Metal[2]
Afghanistan[e]	--	--	--	--	--	--	--	--	--
Australia	2,860	--	212	110	6,000 [e]	--	15	1,515,000	513,000 [e]
Bangladesh[e]	--	--	--	--	--	--	--	--	--
Bhutan[e]	--	--	--	--	--	--	--	--	--
Brunei[3]	--	--	--	--	--	--	--	--	--
Burma	234	--	(5)	--	11,000	30	140 [e]	7,000	--
Cambodia[e]	--	--	--	--	--	--	--	--	--
China[e]	2,800	1,500	90	175	120,000	156,000	61,800	4,050,000	5,210,000
Christmas Island	--	--	--	--	--	--	--	--	--
Fiji	--	--	--	--	--	--	--	--	--
Hong Kong[3]	--	--	--	--	--	--	--	--	--
India[e]	1,020	--	--	--	--	--	--	710,000	795,000
Indonesia[e]	42	--	218 [4]	20 [4]	42,000 [4]	43,000 [4]	--	--	--
Japan	--	--	--	157 [e]	--	947	--	--	578,847
Korea, North[e]	--	--	--	--	--	--	100	70,000	75,000
Korea, Republic of	--	--	--	20 [e]	--	--	--	1,486	828,735
Laos	--	--	--	--	750	--	--	4,320	--
Malaysia	225	--	--	--	3,346	40,267	--	--	--
Mongolia	--	--	--	--	--	--	20	104,700	--
Nauru	--	--	--	--	--	--	--	--	--
Nepal[e]	--	--	--	--	--	--	--	--	--
New Caledonia	--	--	131	40	--	--	--	--	--
New Zealand	--	--	--	--	--	--	--	--	--
Pakistan[e]	--	--	--	--	--	--	--	15	--
Papua New Guinea[e]	--	--	--	--	--	--	--	--	--
Philippines	2	--	241	--	--	--	--	18,170	--
Singapore	--	--	--	--	--	--	--	--	--
Solomon Islands	--	--	--	--	--	--	--	--	--
Sri Lanka[e]	--	--	--	--	--	--	--	--	--
Taiwan	--	--	--	11 [e]	--	--	--	--	--
Thailand[e]	24	--	--	--	282	20,000	600	29,664 [4]	68,203 [4]
Vietnam[e]	28	--	--	--	5,400	3,000	--	38,000	--
Total	7,240	1,500	892	533	189,000	263,000	62,700	6,550,000	8,070,000
Share of world total	46%	81%	31%	38%	74%	83%	86%	53%	62%
United States	--	NA	--	--	--	--	--	769,000	248,000
World total	15,800	1,850	2,910	1,410	256,000	319,000	72,500	12,300,000	12,900,000

See footnotes at end of table.

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TABLE 4—Continued

ASIA AND THE PACIFIC: PRODUCTION OF SELECTED COMMODITIES IN 2011[1]

(Thousand metric tons unless otherwise specified)

Country	Industrial minerals					Mineral fuels			
	Cement, hydraulic	Fluorspar (metric tons)	Graphite (metric tons)	Magnesite	Salt	Coal		Natural gas, dry, marketed/ marketable (million cubic meters)	Petroleum, crude (thousand 42-gallon barrels)
						Anthracite	Bituminous		
Afghanistan[e]	38	--	--	--	190	--	750	142	(5)
Australia	8,600 [e]	--	--	300 [e]	11,744	--	468,000	51,253	143,456
Bangladesh[e]	5,000	--	--	--	1,410	--	700	20,100	1,800
Bhutan[e]	200	--	--	--	--	--	80	--	--
Brunei[3]	275 [e]	--	--	--	--	--	--	12,300	59,400
Burma	538 [e]	--	--	--	35 [e]	--	--	12,500 [e]	6,400 [e]
Cambodia[e]	800	--	--	--	NA	--	--	--	--
China[e]	2,099,000 [4]	4,200,000	800,000	14,500	67,420 [4]	450,000	2,800,000	90,000	1,480,000
Christmas Island	--	--	--	--	--	--	--	--	--
Fiji	120 [e]	--	--	--	--	--	--	--	--
Hong Kong[3]	--	--	--	--	--	--	--	--	--
India[e]	270,000	13,300	150,000	350	16,000	--	500,000	33,000	265,000
Indonesia[e]	29,000	--	--	--	650	110	150,000	76,000	340,000
Japan	51,291	--	--	--	978	--	900 [e]	3,500 [e]	5,235
Korea, North[e]	6,400	12,500	30,000	150,000	500	41,000	--	--	--
Korea, Republic of	48,300	--	--	--	372	2,500 [e]	--	--	--
Laos	400 [e]	--	--	--	35	--	--	--	--
Malaysia	20,000 [e]	--	--	--	--	--	2,916	61,400	221,000 [e]
Mongolia	426	461,000	--	--	2	--	30,940	--	2,549
Nauru	--	--	--	--	--	--	--	--	--
Nepal[e]	300	--	--	--	--	--	16	--	--
New Caledonia	138 [e]	--	--	--	--	--	--	--	--
New Zealand	1,200 [e]	--	--	--	95 [e]	--	4,944	4,003	16,591
Pakistan[e]	32,000	1,600	--	7	2,200	--	3,600	41,000	70,000
Papua New Guinea[e]	--	--	--	--	--	--	--	100	12,500
Philippines	16,063	--	--	--	720	--	6,881	3,975	2,326
Singapore	--	--	--	--	--	--	--	--	--
Solomon Islands	--	--	--	--	--	--	--	--	--
Sri Lanka[e]	2,200	--	3,500	--	11	--	--	--	--
Taiwan[e]	16,852 [4]	--	--	--	--	--	--	330	71 [4]
Thailand[e]	36,700 [4]	2,000	--	--	1,300	--	--	29,100 [6]	51,000
Vietnam	58,994	4,000 [e]	2,000 [e]	--	929 [e]	44,494	--	8,480 [6]	111,315
Total	2,700,000	4,690,000	986,000	165,000	105,000	538,000	3,970,000	447,000	2,790,000
Share of world total	67%	66%	87%	97%	38%	93%	67%	13%	10%
United States	68,600	--	--	W	45,000	2,030	918,000	681,000	2,060,000
World total	4,040,000	7,140,000	1,130,000	171,000	274,000	577,000	5,880,000	3,410,000	27,600,000

See footnotes at end of table.

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TABLE 4—Continued

ASIA AND THE PACIFIC: PRODUCTION OF SELECTED COMMODITIES IN 2011[1]

[e]Estimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. NA Not available. W Withheld to avoid disclosing company proprietary data; not included in world total. -- Zero or zero percent.

[1]Totals may not add because of independent rounding. Percentages are calculated on unrounded data. Table includes data available as of January 31, 2013.

[2]Primary and secondary production.

[3]Not included in Minerals Yearbook 2011, volume III.

[4]Reported figure.

[5]Less than ½ unit.

[6]Natural gas, gross production.

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TABLE 5

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 2005–2018[1]

(Thousand metric tons, gross weight)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	59,960	68,414	69,976	80,000	85,000	91,000
China	22,000	44,000	45,000	46,000	47,000	48,000
India	12,385	9,900	10,300	13,000	15,000	17,000
Indonesia	1,442	1,050	1,100	6,000	8,000	10,000
Malaysia	5	124	188	150	150	150
Other	--	112	110	1,500	3,500	3,800
Total	95,800	124,000	127,000	150,000	160,000	170,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 6

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PRIMARY AND SECONDARY ALUMINUM METAL PRODUCTION, 2005–2018[1]

(Thousand metric tons)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	2,030	2,060	2,075	2,000	2,050	2,100
China	9,740	20,200	22,200	23,000	25,000	27,000
India	942	1,607	1,667	1,800	1,900	2,000
Indonesia	252	253	244	270	280	290
Japan	1,039	126	146	180	200	220
New Zealand	373	380	376	380	380	380
Other	--	--	--	--	--	--
Total	14,400	24,600	26,700	28,000	31,000	33,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 7

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 2005–2018[1]

(Metal content in thousand metric tons)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	930	870	958	1,100	1,200	1,250
China	762	1,160	1,270	1,300	1,400	1,450
India	27	36	38	43	46	48
Indonesia	1,064	878	543	600	800	1,000
Mongolia	127	125	122	550	750	740
Papua New Guinea	193	160	130	80	180	230
Philippines	16	58	64	65	70	100
Other	--	--	198	--	140	240
Total	3,190	3,350	3,320	3,800	4,600	5,100

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 8

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED REFINED COPPER PRODUCTION, 2005–2018[1]

(Thousand metric tons)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	461	417	477	500	500	500
China	2,600	4,650	3,390	5,300	5,600	5,800
India	497	664	673	700	720	740
Indonesia	263	278	257	370	380	380
Japan	1,395	1,549	1,328	1,500	1,600	1,600
Korea, Republic of	519	565	595	600	550	600
Other	--	266	270	290	310	--
Total	6,010	8,390	8,800	9,300	9,700	10,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 9

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 2005–2018[1]

(Metal content in kilograms)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	263,000	261,000	260,000	280,000	300,000	320,000
China	225,000	345,000	362,000	400,000	420,000	430,000
Indonesia	130,620	106,316	96,100	115,000	120,000	125,000
Japan	8,300	8,544	8,691	8,300	8,100	8,000
Laos	6,232	5,061	3,984	7,000	8,000	8,000
Mongolia	24,120	6,037	5,703	17,000	27,000	27,000
New Zealand	10,583	13,494	14,324	12,000	12,000	12,000
Papua New Guinea	68,483	62,900	62,200	54,000	61,000	122,000
Philippines	37,490	40,847	31,120	34,000	35,000	35,000
Other	19,000	18,300	16,300	20,000	22,000	26,000
Total	793,000	867,000	860,000	948,000	1,010,000	1,110,000

[e]Estimated.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 10

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED BENEFICIATED IRON ORE PRODUCTION, 2005–2018[1]

(Metal content in thousand metric tons)

Country	Average ore grade (% Fe)	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	62	163,000	271,000	277,000	330,000	350,000	370,000
China	64	134,000	350,000	400,000	410,000	420,000	430,000
India	64	97,500	147,000	154,000	170,000	172,000	174,000
Korea, North	NA	1,400	1,500	1,500	1,500	1,500	1,500
Other		1,650	3,350	5,490	5,100	5,800	6,600
Total		398,000	773,000	838,000	920,000	950,000	980,000

[e]Estimated. NA Not available.

[1]Estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 11

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED CRUDE STEEL PRODUCTION, 2005–2018[1]

(Thousand metric tons)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	7,790	7,408	6,538	7,000	7,000	7,000
China	353,240	637,230	685,280	740,000	750,000	780,000
India	45,800	68,300	72,200	78,000	80,000	82,000
Japan	112,470	110,000	108,000	114,000	117,000	120,000
Korea, Republic of	47,820	58,914	68,519	65,000	65,000	65,000
Malaysia	5,296	5,693	5,941	6,500	7,000	7,000
Taiwan	18,567	20,498	22,879	23,000	23,000	23,000
Thailand	5,161	4,145	4,000	4,000	4,000	5,000
Other	7,800	12,400	12,900	18,000	21,000	22,000
Total	604,000	925,000	984,000	1,060,000	1,070,000	1,110,000

[e]Estimated.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 12

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PALLADIUM MINE PRODUCTION, 2005–2018[1]

(Metal content in kilograms)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	550	650	600	650	700	700
China	450	650	650	650	700	700
Total	1,000	1,300	1,250	1,300	1,400	1,400

[e]Estimated.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 13

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PLATINUM MINE PRODUCTION, 2005–2018[1]

(Metal content in kilograms)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	111	130	130	200	200	200
China	700	750	750	1,000	1,000	1,000
Total	811	880	880	1,200	1,200	1,200

[e]Estimated.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 14

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED TIN MINE PRODUCTION, 2005–2018[1]

(Metric tons)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	2,819	6,600	6,000	6,000	6,000	6,000
China	126,000	115,000	120,000	120,000	110,000	110,000
Indonesia	78,404	43,258	42,000	44,000	42,000	40,000
Malaysia	2,857	2,668	3,346	2,500	2,500	2,500
Thailand	158	291	282	300	300	300
Vietnam	5,400	5,400	5,400	5,400	5,400	5,400
Other	1,540	4,440	11,800	12,000	13,000	13,000
Total	217,000	178,000	189,000	190,000	180,000	180,000

[1]Estimated.

[e]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 15

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED TIN METAL PRODUCTION, 2005–2018[1]

(Metric tons)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	994	400	400	2,000	2,000	2,000
China	122,000	149,000	156,000	165,000	170,000	180,000
Indonesia	65,300	43,832	43,000	45,000	43,000	41,000
Japan	754	841	947	960	970	980
Malaysia	36,924	38,737	40,267	40,000	40,000	40,000
Thailand	31,600	20,000	20,000	20,000	23,500	30,000
Other	1,800	3,100	3,000	3,000	3,500	3,500
Total	259,000	255,000	264,000	280,000	280,000	300,000

[e]Estimated.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 16

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED DIAMOND PRODUCTION, 2005–2018[1]

(Thousand carats)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	34,307	10,000	7,586	11,000	11,000	11,000
China	100	100	100	100	100	120
India	58	50	48	46	45	45
Indonesia	30	37	37	40	40	40
Total	34,500	10,200	7,770	11,000	11,000	11,000

[e]Estimated.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 17

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED LITHIUM PRODUCTION, 2005–2018[1]

(Metal content in metric tons)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	4,800	8,200	10,000	10,000	10,000	11,000
China	3,600	5,100	5,400	5,600	5,600	5,700
Total	8,400	13,300	15,400	16,000	16,000	17,000

[e]Estimated.

[1]Historic data, estimated data, and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 18

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 2005–2018[1]

(Thousand metric tons)

Country	2005	2010	2011	2014[e]	2016[e]	2018[e]
Australia	370,000	520,000	533,000	530,000	540,000	560,000
China	2,260,000	3,240,000	3,520,000	3,500,000	3,700,000	3,900,000
India	360,000	507,000	528,000	570,000	580,000	590,000
Indonesia	192,920	256,789	260,000	275,000	285,000	290,000
Japan	1,114	1,000	900	600	300	--
Korea, North	23,500	41,000	41,000	40,000	40,000	40,000
Korea, Republic of	2,832	2,500	2,500	2,600	2,700	2,800
Mongolia	8,256	25,246	30,940	40,000	40,000	40,000
New Zealand	5,267	5,330	4,944	6,000	6,000	6,000
Pakistan	3,367	3,429	3,600	3,900	4,100	4,200
Philippines	3,165	6,650	6,881	7,000	9,000	9,000
Thailand	21,429	17,907	18,000	25,000	25,000	25,000
Vietnam	34,093	44,835	44,494	50,000	50,000	50,000
Other	1,450	3,950	4,570	4,800	4,900	4,900
Total	3,290,000	4,650,000	5,000,000	5,100,000	5,300,000	5,500,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

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The Mineral Industry of Afghanistan

By Chin S. Kuo

Afghanistan is a land-locked country. Mineral and energy resources represent a potentially significant source of Afghanistan's wealth. The major mineral resources include chromium, copper, gold, iron ore, lead and zinc, lithium, marble, precious and semiprecious stones, sulfur, and talc. The energy resources consist of natural gas and petroleum. If developed, they could augment the country's economic growth. Resource development would require improvements in infrastructure and security in the country. Investment in infrastructure and transportation projects for mining was a critical aspect of developing the mineral industry.

The Government was undertaking a privatization and licensing program for four of its mineral prospects in 2011. They were the Badakhshan gold project in Badakhshan Province, the Balkhab copper project in Sar-e Pul and Balkh Provinces, the Shaida copper project in Herat Province, and the Zarkashan copper-gold project in Ghazni Province. The Government set a deadline of March 9, 2012, for the submission of expressions of interest in these projects. The tender process for each project was expected to result in the granting of a mining agreement and associated exploration license (Ministry of Mines, 2011).

In an effort to attract foreign investors to help develop Afghanistan's untapped mineral resources, the Government drafted a labor policy that set the minimum age for coal mine workers at 18. The guidelines were scheduled to be implemented in late 2011, and mining inspectors would be employed to ensure that the rules were upheld. Child labor was widespread in Afghanistan, and about 200 children were found to be working in coal mines in central Bamyan Province. Thirty years of conflict has pushed impoverished families to allow children to work in mines. Child labor was also used in small operations, such as cement production (Nichols, 2011b).

The Government planned to build an extensive rail network that would link its borders in a bid to attract investors to its mining projects, such as those for copper and iron ore. In 2010, the first 75-kilometer (km) of the railway was completed. The $180 million rail line, which was financed by the Asian Development Bank, linked Mazar-i-Sharif to Hayratan near the Uzbek border. The Uzbek national rail company Uzbekistan Temir Yollari built the line and agreed to operate it for 3 years. The line had the capacity to handle one-half of Afghanistan's imports from Uzbekistan. The line's extension from Mazar-i-Sharif to Andkhoi on the Turkmenistan border at a cost of between $450 million and $500 million was in the planning stage. An Iran-funded line was under construction from Iran to Herat. Other infrastructure projects were also in the planning stage. These included a $300 million natural gas pipeline project that would link Kandahar to Chaman on the border with Pakistan (Irish, 2011).

Minerals in the National Economy

With international assistance, Afghanistan's economy was recovering from a decade of conflict. In 2011, real gross domestic product (GDP) growth was estimated to be 7.1%; the main contributors to the GDP were the agriculture, industrial, and services sectors. The contribution of the mineral industry to the GDP was insignificant. Afghanistan's mineral industry was at a primitive artisanal stage of development; the operations were all small-scale, and output was supplied mainly to local and regional markets. The country produced cement, coal, natural gas, and some industrial minerals for domestic consumption. Afghanistan exported a s mall amount of precious and semiprecious gemstones and imported petroleum products.

Production

Owing to the lack of mineral production data reported by the miners, information about Afghanistan's mining activities was not readily available, but the activities in general appeared to be limited in scope except for planned operations by foreign companies. The Government provided only partial output data for 2008 through 2010 (table 1). Production of barite was estimated by the U.S. Geological Survey (USGS) to be about 2,000 metric tons (t); chromite, 6,500 t; and natural gas liquids, 45,000 barrels in 2011. Production of cement was estimated to have increased by 6.7% compared with that of 2010, and petroleum condensate, by 9.4%. Output of gypsum, however, was estimated to have decreased by 1.7%. In the process of reconstruction and infrastructure development, output of construction minerals was estimated to have increased to meet the domestic requirements.

Structure of the Mineral Industry

Privatization of Afghanistan's state-owned companies, which controlled many of the country's mineral resources, was ongoing but not complete. The Government encouraged investment in the mineral sector by private domestic companies and foreign investors. Foreign companies from Canada, China, and India had begun to participate in the country's resource development.

The Ministry of Mines is involved in the exploration for and development, exploitation, and processing of minerals and hydrocarbons. The Ministry is also responsible for protecting the ownership and regulating the transportation and marketing of mineral resources in accordance with the country's new laws. Afghanistan's mineral production facilities are listed in table 2.

Commodity Review

Metals

Preliminary work indicated that a number of metallic deposits occur in the country. A high-grade chromite ore deposit was

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discovered in the Eocene Kabul ophiolite in Logar Province. Mercury was known to be present in an epithermal-type mineralization at Kharnak in Ghor Province along with a mineral assemblage of cinnabar, realgar, and stibnite. Known lead-zinc deposits included the Nalbandan fault-related deposit and the Darra-i-Nur and the Kalai-Assad skarn deposits in east-central Afghanistan. Tin and tungsten deposits were found to be fault-zone, pegmatite, or skarn related; these included the Farah skarn tungsten-copper deposit in Farah Province and the Misgaran skarn tin deposit in Herat Province. A uranium prospect was found in veinlets with uraninite in the Khanneshin carbonatite volcanic complex in Helmand Province (Afghanistan Geological Survey, 2011).

Copper.—The Afghan copper belt, which is comparable in extent to the Zambian copper belt, is located in Kabul and Logar Provinces and extends for a length of 600 km; it hosts 3 known copper deposits and 35 known mineral occurrences. The most explored of these deposits was the Aynak deposit, which had an indicated reserve of 240 million metric tons (Mt) at a grade of 2.3% copper, for a total of 5.52 Mt of contained copper. Other known deposits in the belt were the Darband (east of Aynak) and the Jawkar (north of Aynak) deposits. Other significant copper mineralization with gold occurred in the Kundalyan skarn-type deposit in Ghazni and Zabul Provinces in east-central Afghanistan (Afghanistan Geological Survey, 2011).

Metallurgical Corp. of China Ltd. (MCC) expected its $4 billion Aynak copper mine south of Kabul to start production in 2014. The copper project, in which MCC owned a 75% interest and Jiangxi Copper Co. Ltd. held the remaining 25% interest, was delayed for several years by the discovery of historic artifacts at the site. The construction of a rail linking Aynak to Kabul was planned (Reuters, 2011).

Gold.—Gold mineralization was identified in the Zarkashan skarn deposit in Ghazni Province in east-central Afghanistan. Skarn occurred in pockets or as a sheet-like deposit. The Vekadur gold-silver deposit in Badakhshan Province also indicated gold mineralization with a podiform orebody. Placer gold mineralization was found in the Samti deposit where two gold-bearing horizons had been discovered. This alluvial deposit was confined to floodplain and the first terrace of the Panj River (British Geological Survey, 2006).

Afghan Krystal Natural Resources, which was a local company backed by foreign investors from Indonesia, Turkey, the United Kingdom, and the United States, planned to develop a second gold project at Qara Zaghan in Baghlan Province with an investment of $50 million. Exploration activities were expected to intensify in the next 2 years, and production was expected to begin in 2013. The Government would earn 26% in royalties and taxes from the mine. The agreement was facilitated by JPMorgan Chase & Co. of the United States. Westland General Trading LLC of the United Arab Emirates was developing the Nor Aaba gold mine near the Tajik border in Takhar Province (Nichols, 2011a).

Iron Ore.—Four iron ore deposits in addition to Hajigak had been identified in the Afghan iron belt. The largest was the Khaish iron ore deposit in Bamyan Province. Two deposits, the Furmurah and the Syakh Jar, had been discovered in Badakhshan Province, and both were tabular skarn-type deposits. The fourth was the Zerak deposit in Baghlan Province; it occurs in a fault zone with three hematite-magnetite ore zones (Afghanistan Geological Survey, 2011).

Kilo Goldmines Ltd. of Canada and a group of companies from India, which were led by Steel Authority of India Ltd. and National Mineral Development Corp. Ltd., were awarded a $6 billion contract to mine the Hajigak iron ore deposit in the Provinces of Bamyan, Parwan, and Wardak. The deposit extends for more than 32 km, covers 16 separate ore zones, and contains 1,800 Mt of ore at a grade of 62% to 63% iron; it was considered to be the world's leading iron ore resource. The primary ore (which made up 80% of the deposit) contained magnetite and pyrite with a minor amount of chalcopyrite, and the remaining 20% was oxidized hematitic ore. The Government awarded three of the four Hajigak blocks to the Indian companies, which also included Ispat Industries Ltd., Jindal Steel & Power Ltd., JSW Steel Co. Ltd., and Tata Steel. The fourth block was awarded to Kilo Goldmines (Topf, 2011).

Industrial Minerals

The USGS investigated and studied the occurrence of industrial minerals in Afghanistan and showed that the country held deposits of asbestos, barite, clays, dolomite, graphite, limestone, potash, rare earths, sand, and talc. Undiscovered graphite deposits were estimated to be about 1 Mt and were likely to be found in northeastern Afghanistan. Undiscovered potash deposits could be as much as 27.5 Mt in the northern part of the country (Lismore, 2011).

Rare Earths.—The USGS reported a significant deposit of light rare-earth elements (LREE), which was estimated to be as much as 1 Mt, within the Khanneshin carbonatite complex in the Registan desert of Helmand Province. The deposit was comparable in grade to the world-class LREE deposits of Mountain Pass in the United States and Bayan Obo in China. The LREE included cerium, lanthanum, neodymium, and praseodymium. In addition to LREE, the deposit also contained barium, phosphorus, strontium, and uranium. The primary area of mineralization covered 0.74 square kilometer and was first identified by Soviet geologists in the 1970s (Tucker and others, 2011).

Mineral Fuels

Petroleum.—The Government of Afghanistan had decided to award its first international oil-production contract to China National Petroleum Corp. (CNPC) for three blocks in the Amu Darya Basin in the northwest of the country. Other bidders included Buccaneer Energy of Australia, Shahzad International of Pakistan, and Tethys Petroleum Ltd. of the United Kingdom. The three blocks—the Bazarkhami, the Kaskari, and the Zamarudsay—held an estimated 80 million barrels (Mbbl) of oil. CNPC offered to pay a 15% royalty on each barrel of crude oil and a 30% corporate tax on its profits, as well as to build a $300 million refinery. The Government also was planning to conduct seismic surveys before tendering blocks in the Afghan Tajik basin, which was estimated to contain 1,800 Mbbl of oil (Petroleum Economist, 2011).

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Outlook

Afghanistan's economic growth is expected gradually to rely on the development of its rich mineral resources. Foreign investment in infrastructure and transportation for mining is a key factor to develop its mineral industry. Some copper and gold projects are in the development stage and are expected to start production in 2013 or later. Contracts for iron ore and petroleum projects have been awarded. The country is expected to offer more tenders of bids for resource development in the near future.

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TABLE 1

AFGHANISTAN: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011
Barite		2,000	2,000	2,000	2,000	2,000
Cement, hydraulic		30,000	37,300 [3]	31,500 [3]	35,600 [3]	38,000
Chromite		6,800	7,000	6,000	6,000	6,500
Coal, bituminous		250,000	346,900 [3]	500,100 [3]	724,900 [3]	750,000
Gas, natural:						
Gross	million cubic meters	135	155 [3]	142 [3]	142 [3]	145
Marketed	do.	130	145	140	140	142
Gypsum		35,000	48,700 [3]	46,400 [3]	63,100 [3]	62,000
Marble		30,000	36,900 [3]	26,600 [3]	28,900 [3]	30,000
Natural gas liquids	thousand 42-gallon barrels	45	45	45	45	45
Nitrogen, N content of ammonia		16	18 [3]	22 [3]	27 [3]	28
Petroleum, condensate	42-gallon barrels	100	156 [3]	104 [3]	64 [3]	70
Salt, rock		170,000	158,200 [3]	180,300 [3]	186,100 [3]	190,000

do. Ditto.

[1]Estimated data are rounded to no more than three significant digits.

[2]Table includes data available through June 28, 2012.

[3]Reported figure.

TABLE 2

AFGHANISTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Aluminum:			
Extrusion and powder coating	Qader Najib Ltd.	Kabul	NA
Manufacture	Salam Bilal Ltd.	Kandahar	360
Copper, in concentrate	Aynak Minerals Co. Ltd. (China Metallurgical Group Corp., 75%, and Jiangxi Copper Co. Ltd., 25%)	Aynak, Logar[1]	180,000
Fertilizer, urea	Kud Bergh Fertilizer Ltd.	Qala Jangi near Mazar-i-Sharif	105,000
Lapis-lazuli kilograms	Government owned	Sary-Sang, Badakhshan	9,000
Steel, manufacture	Khalil Najeeb Steel Mills Ltd.	Jalalabad, Kabul, and Mazar-i-Sharif	36,000

[e]Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

[1]The Aynak Mine is expected to start production in 2014.

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The Mineral Industry of Australia

By Pui-Kwan Tse

Slow growth in the economies of the Western developed countries in 2011 negatively affected economic growth in many counties of the Asia and the Pacific region. China continued to have rapid economic growth in the first part of the year and helped to sustain demand for Australia's mineral products. By mid-2011, however, China's economic growth had moderated. Also, extreme weather conditions across the States of Queensland, Victoria, and part of New South Wales caused disruptions to regional economic activities in the first quarter of 2011. As a result, Australia's gross domestic product (GDP) increased at a rate of 2.3% during 2011, which was lower than the 2.7% recorded in 2010. The lower annual growth rate was attributed to weaker export growth, including in the mineral sector. Australia was one of the world's leading mineral-producing countries and ranked among the top 10 countries in the world in the production of bauxite, coal, cobalt, copper, gem and near-gem diamond, gold, iron ore, lithium, manganese ore, tantalum, and uranium. With a number of large-scale mining projects underway, investment in the mineral sector increased significantly in 2011 (Reserve Bank of Australia, 2012, p. 33).

Australia's total mineral exploration spending was estimated to be $3.1 billion (A$3.0 billion) in fiscal year 2011, which was an increase of 32% from that of fiscal year 2010 (the Australian fiscal year runs from July 1 to June 30). The increase in exploration spending was the result of an increase in exploration for base metals, coal, gold, and iron ore. About 65% of the country's total exploration expenditure was spent on known deposits, and the remaining 35% was spent on new exploration projects. Western Australia accounted for 54% of the total exploration spending followed by Queensland, 22%; South Australia, 9%, and others, 15%.The increase in exploration spending on coal was in response to higher expectations of coal demand in the world in the medium to longer term. An increase in uranium exploration spending reflected the government of Western Australia's removal of a ban on uranium mining in the State (Geoscience Australia, 2012, p. 1–2).

As a result of the spending on exploration, significant mineral resources were discovered. These included the Boston Shaker gold project near Kalgoorlie, Western Australia; the Carrapateena copper-gold-uranium project near Gawler Craton, South Australia; the Four Eagles gold project near Bendigo, Victoria; the Griffiths Hill copper project near Chillagoe, Queensland; the Mutooroo iron ore project at Broken Hill, New South Wales; the Pilgangoora lithium project near Port Hedland, Western Australia; the Tottenham copper project near Dubbo, Tasmania; and the TUC Resourced Ltd.'s heavy-rare-earth prospect at Stromberg, Northern Territory (Geoscience Australia, 2012).

Minerals in the National Economy

Australia's mineral sector contributed more than $100 billion, or about 8%, to the country's GDP in 2011. The mineral sector employed 205,000 people. Expectations of sustained levels of global demand for minerals led to increased production of minerals and metals in Australia, and the mineral industry was expected to continue to be a major contributor to the Australian economy in the next several years (Australian Bureau of Resources and Energy Economics, 2012b, p. 12).

Government Policies and Programs

The powers of Australia's Commonwealth Government are defined in the Australian Constitution; powers not defined in the Constitution belong to the States and Territories. Except for the Australian Capital Territory (that is, the capital city Canberra and its environs), all Australian States and Territories have identified mineral resources and established mineral industries. Each State has a mining act and mining regulations that regulate the ownership of minerals and the operation of mining activities in that State. The States have other laws that deal with occupational health and safety, environment, and planning. All minerals in the land are reserved to the Crown; however, a very small percentage of minerals in Australia are owned by those who were granted titles to the land before enactment of relevant State legislation that excludes mineral ownership. Companies or miners may obtain rights to conduct mining activities on unreserved Crown land where the permission of the landowner has been granted. Royalties on minerals are charged by State and Territorial governments. In most cases, royalties are payable on a percentage of value or a flat rate per unit basis. Each State sets its own rate. Northern Territory's royalties are based on profit where the net value of a mine's production is used to calculate the applicable royalty. The royalty paid by a company is allowed to be deducted from reported income for income tax purposes. The amount of royalty paid can be reduced by deducting the costs incurred in the transportation of the mineral ore, concentrate, or metal.

The Australian Parliament passed the minerals resource rent tax (MRRT) bill in November 2011. A uniform national MRRT was to take effect on July 1, 2012. The MRRT, which applies only to coal and iron ore mining, is intended to target project profits rather than project production and to shift the tax burden from low-profitability projects to more profitable projects. The MRRT would be set at an internationally competitive rate of 22.5% and companies would not be charged the MRRT when the net mining profits are equal to or less than A$75 million (US$77.5 million). Companies would be entitled to have an MRRT offset year if the company's group mining profit for the year is less than A$125 million (US$129.2 million). All Federal and State resource taxes would be credited. The bill passed in November also included an extension of the

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petroleum resource rent tax (PRRT) for all Australian onshore and offshore oil and gas projects, including the North West Shelf. The PRRT tax rate would be 40%. The tax value of losses could be transferred only in very limited circumstances. All Federal and State resource taxes would be creditable against the current and future PRRT liabilities from a project. The PRRT was not being extended to projects within the Joint Petroleum Development Area in the Timor Sea, which was governed by the Timor Sea Treaty (Parliament of the Commonwealth of Australia, The, 2012, p. 15–60).

Australia was one of the world's highest per capita carbon dioxide emission countries. The Government decided to impose a carbon tax at a rate of A$23 (US$23.77) per metric ton of carbon dioxide emitted starting on July 1, 2012, and the rate would be increased to A$25.4 (US$26.25) per metric ton in fiscal year 2015. The Australian Trade and Industry Alliance, which included the Australian Chamber of Commerce and Industry, the Australian Coal Assoc., the Minerals Council of Australia, and the Plastics and Chemical Industries Assoc., opposed the carbon tax scheme because it would make Australia's mineral industry less competitive internationally and the Australian carbon tax would be the highest such tax among the industrialized countries. The scheme would allow emissions trading beginning in 2015, at which time polluters and investors would be able to buy overseas carbon offsets, or ultimately trade within Europe and New Zealand and possibly in China and the Republic of Korea. Australian companies urged States and Territories to reduce State-based royalties or to allow them to be deducted from the MRRT to cover the carbon tax costs. The Government estimated that the carbon tax strategy would reduce Australia's emissions to 5% below the level in 2000 by 2020 (Mineral Council of Australia, 2011).

Production

Australia continued to be one of the world's leading producers of such mineral commodities as bauxite, coal, cobalt, copper, gem and near-gem diamond, gold, iron ore, lithium, manganese ore, tantalum, and uranium. The country's refined metal production capacity was moderate in the Asia and the Pacific region compared with that of China and Japan. Because of its large mineral resources, Australia was virtually self-sufficient in most mineral commodities. Petroleum production, however, supported only about 70% of the country's consumption. Australia was one of the world's leading exporting countries for alumina, coal, iron ore, and uranium. In general, mineral and metal production were about the same in 2011 as in 2010. Commodities for which production decreased in 2011 were diamond, iron and steel, mined lead, and mined tin. Commodities for which reported production increased included mined antimony, mined copper, iron ore, mined and refined nickel, refined silver, titanium concentrates, and zircon. The increase of iron ore output was from record production at mines operated by BHP Billiton Ltd., Fortescue Metals Group Ltd., and Rio Tinto Ltd. BHP Billiton's Olympic Dam returned to its full production in 2011. An increase in mined nickel production reflected increased output from BHP Billiton's Nickel West and Western Areas NL's Spotted Quoll and Forrestania operations (table 1).

Structure of the Mineral Industry

The Australian mineral industry is characterized by free enterprise in which private companies are involved in exploration, mine development, mineral production, mineral processing, and marketing. A number of Australian mineral companies were affiliates or subsidiaries of European and U.S. companies, which controlled a large part of the mining, smelting, and refining sectors and a significant portion of the mineral fuels sector (table 2).

Each State and Territorial government administers the mineral industries within its own borders, which includes registering land titles; issuing exploration and development permits; conducting inspections and assuring compliance with health, safety, and environmental regulations; and levying royalties and taxes. Because the Commonwealth Government may restrict mineral exports for the good of the country, however, it effectively has control over most mineral production.

Mineral Trade

Australia continued to rely heavily on exports of the majority of its mineral production to sustain the country's mineral industry development. In 2011, the value of Australia's total foreign trade of goods was US$637.7 billion (A$607.3 billion), of which the value of exports was US$329.0 billion (A$313.3 billion) and the value of imports was US$308.7 billion (A$294.0 billion). As a result of higher energy and mineral commodity prices and an increase in the volume of exports, Australia's export revenue increased by about 15% to US$190 billion. Mineral and metal exports accounted for about 58% of the total value of exports. Mineral commodities for which the export volume was higher than in 2010 included bauxite, thermal coal, copper, iron ore, lead, manganese ore, nickel, uranium, and zinc. The value of iron ore exports accounted for 31% of the total value of mineral and metal exports followed by coal, 25%; gold, 8%; oil, 6%; and liquefied natural gas, 6%. Australia's mineral and metal exports went mostly to Asian countries. Australia remained one of the world's leading exporters of alumina, coal, diamond (gem, near-gem, and natural industrial), ilmenite, iron ore, mined lead, rutile, and zircon. Crude petroleum and refined petroleum products remained Australia's leading imported fuel and mineral commodity category, followed by gold, iron and steel, potassium fertilizer, and silver (Australian Bureau of Statistics, 2012, p. 29).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—Australia was the leading bauxite-producing country in the world. Bauxite was mined at the Gove Mine in the Northern Territory; the Weipa Mine in the northern part of Queensland; and the Huntly, the Willowdale, and the Worsley Mines in Western Australia. Australia was also the leading alumina-producing country in the world. All Australia's alumina refineries were located in close proximity to their bauxite mines and shipping facilities. Western Australia remained the leading bauxite-producing State

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and accounted for about 60% of the country's total output of bauxite followed by Queensland, 30%, and Northern Territory, 10%. Australia exported 11.3 million metric tons (Mt) of bauxite compared with 8.0 Mt in 2010. Western Australia was the leading alumina-producing State in Australia and accounted for about 60% of the country's alumina output. The country exported 16.0 Mt of alumina in 2011, which was about 1% less than in 2010. The United Arab Emirates replaced China as the leading destination for exported Australian alumina; it received about 22% of the total exported volume, followed by China and South Africa, 13% each; and other countries, less than 10% each. The consumption of domestic aluminum smelters was less than 20% of the country's total alumina output, and the remainder was exported. In 2011, Australia exported 1.7 Mt of aluminum. Japan was the leading destination for Australian aluminum exports and accounted for 34% of the total, followed by the Republic of Korea, 18%; Taiwan, 12%; and Thailand and Indonesia, 8% each; the remainder went to other countries in the world (Australian Bureau of Resource and Energy Economics, 2012, p. 21; Department of Mines and Petroleum, 2012, p. 9).

Owing to increasing demand for alumina in China in recent years, Australian producers expanded the output capacities of their bauxite mines and alumina refineries. Queensland Bauxite Ltd. received exploration licenses from the Queensland government to explore for bauxite within the eastern Australian bauxite province (which stretches from Queensland to New South Wales). The combined area of the prospective bauxite terrain was about 7,810 square kilometers (km^2). The North Queensland project consisted of four areas—Atherton, Ravenshoe, Ravenshoe East, and South Johnstone. The South Johnstone area, which is located 18 kilometers (km) inland from the Mourilyan Port, was explored by Carpentaria Exploration Pty Ltd. in the 1960s. About 200 to 250 Mt of bauxite containing between 31% and 40% acid-soluble alumina was identified. The South Queensland project consisted of three areas—Childers, Kingaroy, and Pittsworth—which were located in and around the town of Kingaroy and east of the town of Childers. Analytical results of collected samples from these areas indicated that high-grade gibbsite mineralization was present. The company planned to continue exploring in these areas (Queensland Bauxite Ltd., 2012, p. 6–15).

Cape Alumina Ltd. continued exploring in 2,400 km^2 of leased land outside of Rio Tinto Alcan's Weipa deposit. The company's Pisolite Hills deposit was located 50 km northeast of Weipa and between 2.8 and 15 km from the Wenlock River on the western part of Cape York Peninsula. The Pisolite Hills deposit had estimated bauxite resources of about 135 Mt, which could produce up to 7 million metric tons per year (Mt/yr) of dry bauxite product for 15 years. The company completed a feasibility study and prepared a bankable feasibility study and an environmental impact statement for the Pisolite Hills project. Cape Alumina also completed a review of the effect of the declaration of the Wenlock River Basin as a wild river area under the Queensland's Wild Rivers Act (2005). The review indicated that about 45% of the bauxite resources was within the 500-meter (m)-wide high-preservation area. The company planned to discuss access to the high-preservation area with officials of the government of Queensland and the Federal Government. The company decided to maintain its mining lease application and to continue environmental studies of the Pisolite Hills project. In 2010, Cape Alumina discovered new bauxite resources at the Bauxite Hills prospect, which was located about 96 km north of Weipa and about 5 km southeast of the existing port at Skardon River. The company conducted a concept study on the Bauxite Hills deposit in 2011. The plan was to mine a total of 100 Mt of bauxite in 15 years. The beneficiated grade of the dry bauxite was designed to contain between 48% and 52% alumina and 8% and 12% silicon oxide (Cape Alumina Ltd., 2012, p. 16–18).

Rio Tinto Alcan was conducting a feasibility study and an environmental impact study to develop the bauxite resource in an area south of Embley River and the existing Weipa Mine. The new operation would progressively replace depleted resources at the Andoom and the East Weipa mining areas in Weipa. It would extend the mine life in the area by 40 years. The new development would increase output capacity to 50 Mt/yr from the current capacity of 21 Mt/yr in the region south of the Weipa Peninsula. Construction of a bauxite mine was scheduled to begin in 2012, depending on regulatory and internal company approvals. The Weipa expansion could be completed within 3 years of environmental approval. First shipments were expected to be in 2016. In 2011, bauxite production at the Weipa Mine increased by 9% to meet the demand from a third party. The production of alumina decreased by 4% because of abnormally heavy rains in Queensland during the first quarter of 2011. The company decided to accelerate the construction of the Yarwun refinery expansion, which was rescheduled to be put into operation in the second half of 2012 (Rio Tinto plc, 2012, p. 20–21).

Australia's primary aluminum production ranked fourth in the world after China, Russia, and Canada. Aluminum output was produced mainly from Alcoa of Australia's Point Henry and Portland smelters in Victoria, Hydro Aluminium Kurri Kurri Pty. Ltd.'s Kurri Kurri smelter in New South Wales, and Rio Tinto Alcan's Bell Bay smelter in Tasmania, as well as the Boyne Island smelter in Queensland and the Tomago smelter in New South Wales. Norsk Hydro ASA of Norway decided to curtail the output of aluminum at its Kurri Kurri smelter because of low aluminum prices in the world market and increased production costs. The company planned to close the smelter in 2012 (Norsk Hydro ASA, 2012a, p. 10; 2012b).

Antimony.—Compared with China, Australia was a relatively small antimony producer in the world. Australia's antimony was produced from Mandalay Resources Ltd.'s Costerfield Mine in Victoria and Straits Resources Ltd.'s Hillgrove Mine in New South Wales. Mandalay Resources acquired the Augusta Mine in December 2009 after its operation was suspended in 2008 because of low antimony prices. Mandalay restarted the exploration in 2010 and discovered new reserves deeper on the Augusta E and W lodes. The company discovered additional resources in the Cuffley lode and found new veins in the district and subsequently renamed the Augusta Mine as the Costerfield Mine. At yearend 2011, the mine had ore resources of 361,000 (t) metric tons at an average of grade 9.8 grams per metric ton (g/t) gold and 5.5% antimony. The company planned to perform a feasibility study to develop and mine the Cuffley

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lode and to increase antimony production to about 1,800 t in 2012. Straits Resources placed the Hillgrove Mine on care-and-maintenance status (Mandalay Resources Ltd., 2012, p. 16).

Cobalt and Nickel.—Australia's main nickel ores were primary sulfides of nickel, which occur as lodes within mafic and ultramafic (iron- and magnesium-rich) igneous rocks that have a volcanic and subvolcanic origin. Western Australia was the leading State for mined nickel output and accounted for more than 90% of the country's total output. The top five nickel producers accounted for 80% of the total sales. BHP Billiton's Nickel West project was Australia's leading nickel operation. Nickel West included the Leinster and the Mount Keith Mines. A number of smaller sulfide nickel operations were operated by Mincor Resources NL and Xstrata Nickel Australia Pty Ltd. [a subsidiary of Xstrata plc (Xstrata)]. Owing to low nickel prices, OJSC MMC Norilsk Nickel (Nornickel) of Russia shut down its nickel operations in Australia in 2009 and 2010, and most of its nickel operations remained closed in 2011. During 2010, the company tried to enrich its nickel at the Lake Johnston operation, which was located about 500 km east of Perth in Western Australia. In July 2011, the company restarted the production of nickel concentrate at Lake Johnston and produced 1,748 t of nickel in concentrates. It also investigated using its hydrometallurgical technology (Activox® Process) at its processing facility at Cawse to process nickel sulfide ore from Nornickel's deposits in Australia. Nornickel planned to produce a nickel hydroxide solution that would contain about 50% nickel and then refine it into the metal product (OJSC MMC Norilsk Nickel, 2012).

Panoramic Resources Ltd. operated two nickel mines—Lanfranchi and Savannah—in Western Australia. The Lanfranchi operation was located 42 km south of Kambalda. Mined ore from Lanfranchi was shipped to the Kambalda concentrator, which was operated by Nickel West (a subsidiary of BHP Billiton). BHP Billiton had a tolling and concentrate purchase agreement with Panoramic to process up to 350,000 metric tons per year (t/yr) of Lanfranchi ore. The Savannah operation was located 240 km south of Kununurra. Panoramic had a contract agreement with China's Jinchuan Nonferrous Metals Corp. to ship all Savannah's concentrate output to China. Panoramic discovered additional nickel mineralization down plunge from the Helmuth South deposit, and a feasibility study was undertaken on the Cruickshank ore body, which is located 6 km northeast of the Lanfranchi operation (Panoramic Resources Ltd., 2011, p. 3).

In 2008, Fox Resources Ltd. placed the Radio Hill Mine on care-and-maintenance status because of the low price of nickel on the world market. The company decided to use a bacterial heap-leaching process to extract copper and nickel ore that had an average grade of 0.79% copper and 0.59% nickel. The nickel recovery rate was in the range of 80% to 85% and the recovery rate for copper was about 55% in the laboratory. The company believed that the leaching process would reduce production and transportation costs. Fox Resources planned to build a small-scale demonstration plant to evaluate the process. The company continued to undertake the development of the Sholl deposit, which was estimated to have a mineral resource of 8 Mt grading 0.67% copper and 0.54% nickel (Fox Resources Ltd., 2012, p. 3–5).

In 2009, BHP Billiton placed the Ravensthorpe Mine on care-and-maintenance status because of the decrease in the price and demand for nickel on the world markets after the mine officially opened in mid-2008. In December 2009, BHP Billiton decided to sell the Ravensthorpe Mine to First Quantum Minerals Australia (a subsidiary of First Quantum Minerals Ltd. of Canada) for $340 million; the sale was completed in 2010. First Quantum Minerals planned to invest $190 million to modify the hydrometallurgical processing plant, and the plant started production in October 2011. The company planned to produce between 33,000 and 36,000 t of contained nickel in 2012. The company estimated that the Ravensthorpe Mine contained sufficient nickel resources to support a mine life of more than 30 years (First Quantum Minerals Ltd., 2012).

Copper.—Australia's copper resources occur largely at Olympic Dam in South Australia and at Mount Isa in Queensland. Other important copper resources are located at the CSA and the Northparkes deposits in New South Wales; the Ernest Henry, the Mammoth, and the Osborne deposits in Queensland; and the Golden Grove and the Nifty deposits in Western Australia. Australia's mined copper output ranked the country among the top five producers in the world. In 2011, Australia's copper mine production increased slightly from that of 2010. The increase came from the expansion of the DeGrussa and the Prominent Hill Mines and development of the new Kanmantoo Mine. Australia's mined copper production was expected to increase during the next several years. Several new mines were expected to start up, including CuDeco Ltd.'s Rockland Mine, Golden Cross Resources Ltd.'s Copper Hill Mine, and Ivanhoe Australia Ltd.'s Mount Dore Mine. The increase in refined copper production reflected the restart of production at the Lady Annie solvent extraction–electrowinning (SX–EX) operation. South Australia, which accounted for 33% of the country's output, replaced Queensland as the leading State for mined copper production. Queensland's output contributed 31% of the country's total output in 2011, and New South Wales's output accounted for 18%. Western Australia's mined copper decreased to 15% of the total in 2011 from 20% in 2010. Tasmania's mined copper output was mainly from Mount Lyell. In 2011, Australia exported a total of 1.8 Mt of copper concentrates compared with 1.9 Mt in 2010. China retook the lead as the leading destination for exports of Australian copper concentrates and received 35% of the total exported; India, 31%; Japan, 21%; and the Republic of Korea, 11%. Australia increased its refined copper exports to 379,000 t in 2011 from 315,000 t in 2010. China was the leading destination, which received 36% of the total exported; Malaysia, 20%; Taiwan, 15%; and Indonesia, 7% (Australian Bureau of Resources and Energy Economics, 2012a, p. 24).

Sandfire Resources NL discovered the high-grade DeGrussa volcanogenic copper-gold deposit in the northeastern part of its Doolgunna tenement area, which is located 900 km northeast of Perth, in 2009. Exploration work continued in 2010. The prefeasibility study indicated that the deposit contained indicated and inferred mineral resources of 10.67 Mt of ore at average grades of 5.6% copper, 15 g/t silver, and 1.9 g/t gold.

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The construction of the project started in 2011 and was scheduled to be completed in early 2012. Construction of the processing plant was scheduled to be completed in the third quarter of 2012. The company planned to have two-stage open pit mining in operation in 2 years to mine high-grade direct-shipment ore of 143,000 t/yr at average grades of 25.6% copper and 2.5 g/t gold and 298,000 t/yr of sulfide material at average grades of 6.0% copper and 2.4 g/t gold. Sandfire Resources had secured the sale of 100% of its direct-shipment ore to MRI Trading AG and Yunnan Copper Corporation Ltd. of China in 2011. The nondirect shipment ore would be processed together with underground ore to produce copper concentrate at an average grade of 27% copper for exporting to international customers. The company planned to produce between 60,000 and 70,000 t/yr of copper and about 1.3 t/yr of gold for about 7 years (Sandfire Resources NL, 2011, p. 6; 2012).

In 2010, Ivanhoe Australia Ltd. acquired the Osborne operation, which is located 120 km northeast of Boulia, Queensland, from Barrick Gold Corp. of Canada. The Osborne operation included the Osborne open pit and underground mines and the Houdini and the Kulthor deposits. The operation was on care-and-maintenance status in 2010. Ivanhoe restarted the development of the Osborne operation in 2011, and a road was built to link the Osborne operation to Ivanhoe's Merlin molybdenum and rhenium mine, which was under development. The company invested $30 million to redevelop the Kulthor and the Osborne underground mines. The Osborne operation had measured and indicated mineral resources of 13.1 Mt at grades of 1.4% copper and 0.9 g/t gold and inferred mineral resources of 7.9 Mt at grades of 1.3% copper and 1.0 g/t gold. The renovation of the processing plant started in 2011, and the plant was scheduled to be put into operation in the first quarter of 2012. The plant was designed to have ore throughput of about 5,200 metric tons per day to produce metal concentrates of 21,000 t/yr of copper and 1.0 t/yr of gold (Ivanhoe Australia Ltd., 2011, p. 8).

Ivanhoe's Mount Dore project was located 50 km from its Osborne operation. A scoping study was completed in 2011, and the prefeasibility study began in the same year. Mount Dore was a polymetallic oxide and sulfide deposit. The deposit was estimated to contain 750,000 t of copper, 430,000 t of zinc, 840 t of silver and 14.3 t (460,000 troy ounces) of gold. About 57 Mt of ore at a grade of 0.59% copper was amenable to heap leaching (Ivanhoe Australia Ltd., 2012, p. 22–23).

OZ Minerals Ltd.'s Prominent Hill operation started mining at the Malu open pit in 2009; the operation is located 650 km northwest of Adelaide in South Australia. The operation's processing plant was designed to produce about 100,000 t/yr of copper in concentrates. During the past 2 years, the processing plant achieved throughout of 25% more than its designed capacity. In 2011, the Prominent Hill operation produced 107,744 t of copper in concentrates and 5.0 t (160,007 troy ounces) of gold. The company decided to develop its Ankata underground deposit, which was located about 800 meters from the Malu open pit. The construction of the Ankata underground mine was scheduled to be completed in early 2012, and the underground mine was designed to produce 25,000 t/yr of copper and about 370 kg/yr (12,000 troy ounces per year) of gold. The cost of the development of the Ankata Mine was projected to be $148 million. The Prominent Hill had reserves of 72.3 Mt of ore grading 1.13% copper and 0.64 g/t gold. In 2011, OZ Minerals acquired the Carrapateena copper-gold prospect, which is located 250 km southeast of Prominent Hill, from Rudy Gomez Services Ltd. and its associates for $250 million. The prospect was estimated to have resources of 203 Mt of ore grading 1.31% copper, 6.0 g/t silver, and 0.56 g/t gold. It also contained 270 parts per million (ppm) uranium oxide. The company planned to continue drilling in the area and to perform scoping studies on the prospect and would make a decision on whether to mine at Carrapateena by 2015 (OZ Minerals Ltd., 2012, p. 10–15).

Gold.—Gold mine output in Australia ranked the country among the world's top four producers, together with China, South Africa, and the United States. In 2011, Australia's mined gold output decreased by about 1% from that of 2010, and output of refined gold decreased by about 9%. The decrease in production was attributed to a number of mines taking advantage of high gold prices to target lower ore grades that would have been uneconomic to extract at lower prices. Western Australia remained the leading gold-producing State, with a 69.4% share, followed by New South Wales, 11.6%; Queensland, 6.2%; and Northern Territory, 3.5%; South Australia, Victoria, and Tasmania accounted for the remaining 9.3% share. The country's gold resources occur and are mined in all States, as well as in the Northern Territory, and much of the gold was produced from large open pit mines. Owing to higher prices of gold in the world markets, gold operators could afford to reduce the grade of ore fed into their processing plants in order to extend mine life. In 2011, Australia exported 308 t (compared with 332 t in 2010) of refined gold produced from domestic mines or from imports of gold dore and scrap that were shipped from overseas, refined into gold bullion, and then reexported. Weaker global demand for gold bullion coins and bars had contributed to the decrease of refined gold exports. India, the United Kingdom, and Thailand accounted for 75% of Australia's total gold exports (Australian Bureau of Resources and Energy Economics, 2012a, p. 26).

Crocodile Gold Corp. of Canada held a 3,300-km^2 land tenement in the Northern Territory. Crocodile's Burnside project, which is located about 150 km south of Darwin, consisted of several gold deposits, including the Brocks Creek, the Cosmo, and the Howley deposits. In 2009, Crocodile Gold commenced its mining operations at the Brocks Creek Mine (underground) and the Howley Mine (open pit), which was known as the "Chinese operation." Ores were transported to its Union Reefs mill for processing. The Union Reefs mill had a carbon-in-leach processing capacity of 2.4 Mt/yr of ore. The company completed a feasibility study at the Princess Louise open pit mine and the Cosmo underground mine. The construction of the Cosmo Mine was scheduled to be completed in late 2011 and to be put into full operation in 2012. The company planned to process 263,000 metric tons per month (t/mo) of ore to produce about 2.6 t (85,000 troy ounces) of gold from the Cosmo Mine in 2012. Crocodile Gold planned to produce a total of more than 6.2 t (200,000 troy ounces) of gold in 2012. The company's Union Reefs project, which was located

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about 15 km north of Pine Creek and 185 km southeast of Darwin, and the Maud Creek project, which was located 285 km south-southeast of Darwin, continued to be explored in 2011. The ore body of the Maud Creek deposit was largely oxidized to a depth of 15 to 20 m and moderately oxidized from 25 to 30 m. It also contained about 2% arsenic. Use of a conventional direct-cyanidation process method might not be possible for treating this ore. The Union Reefs prospect area had been mined since 1880. Acacia Resources Ltd. and Anglo Gold Australia bought the property in 1991 and mined there from 1995 to 2003. About 25 t (800,000 troy ounces) of gold had been produced during that period. Crocodile Gold planned to target high-grade underground resources (Crocodile Gold Corp., 2012, p. 8–15).

Ramelius Resources Ltd. operated two gold mines—Mount Magnet and Wattle Dam—in Western Australia. Ramelius Resources acquired the Mount Magnet Mine from Harmony Gold (Australia) Pty Ltd. in 2010, and the company considered the area to have potential for significant new discoveries. In 2011, the Board of Ramelius Resources approved the redevelopment of the Mount Magnet open pit mine operation and the exploration of gold resources further below the surface that aimed for future underground mining. The company estimated that the Mount Magnet operation area could support the production of about 16.2 t/yr (520,000 troy ounces) of gold for 6 years. The open pit of the Wattle Dam gold mine was commenced in 2006, and the underground development was put into operation in 2009. In fiscal year 2011, the company's processing plant at Burbanks processed 153,060 t of Wattle Dam ore and recovered 3.1 t (100,720 troy ounces) of gold. In 2011, the company's Board approved drilling the deeper areas, and the drilling results indicated that mineralization of Block D was similar to the mining areas of Blocks A and B. The company planned to start mining Block D in late 2011 (Ramelius Resources Ltd., 2011, p. 3–10).

Iron Ore and Iron and Steel.—Australia was among the top three iron ore producers (in terms of iron content) in the world, along with Brazil and China. Australia's most significant iron ore mines were located in the Pilbara region of Western Australia, which accounted for 97.0% of the country's total iron ore production followed by South Australia, 2.0%; and the Northern Territory and Tasmania, 0.5% each. Owing to its limited domestic demand and production capacities for iron and steel, Australia exported more than 90% of its iron ore output to such Asian countries as China, Japan, the Republic of Korea, and Taiwan. In 2011, Australia's iron ore and pellet exports increased to 439 Mt from 402 Mt in 2010. Australia's iron ore exports to China increased to 306 Mt in 2010 from 274 Mt in 2010. Japan's iron ore imports from Australia decreased to 75 Mt from 76 Mt; the Republic of Korea's imports increased to 45 Mt from 40 Mt; and Taiwan's imports remained the same at 12 Mt (Australian Bureau of Resources and Energy Economics, 2012a, p. 27).

China had been the world's leading importer of iron ore during the past several years, and this trend was expected to continue during the next 5 years. Australian iron ore producers expanded their iron ore production facilities to meet its neighboring countries' demand. A number of iron ore projects that would contribute to Australia's exports were at various stages of development. Rio Tinto's iron ore operations were mainly in the Pilbara region and produced a total of about 225 Mt/yr of iron ore from 14 mines. Rio Tinto planned to invest $3.4 billion to expand its Pilbara operations. The company decided to expand the iron ore production at the Brockman 4, the Hope Downs 4, the Marandoo, the Nammuldi, and the Yandicoogina Mines to a total of 283 Mt/yr in 2013 and 353 Mt/yr in 2015. To meet the iron ore handling capacity at the port, the company planned to replace the aging car dumper with a new duel car dumper at Cape Lambert. The company's port facilities at Dampier, including the East Intercourse Island and Parker Point terminals, and Cape Lambert would have the capacity to handle about 353 Mt/yr of iron ore in 2015. Rio Tinto planned to invest $518 million to implement an automated long-distance heavy-haul rail at its 1,500-km rail network. The driverless trains would be launched in 2014 (Rio Tinto Ltd., 2012b, c).

The expansion construction of BHP Billiton's Jimblebar Mine, which is located 40 km east of Newman in Western Australia, was underway in 2011. The expansion of the Jimblebar Mine's output capacity to 35 Mt/yr started in 2010 and was projected to increase BHP Billiton's iron ore production in the Pilbara region to 240 Mt/yr in 2013. An expansion of the loading capacity at the inner harbor at Port Hedland to 220 Mt/yr and work on the duplication of rail tracks were part of the company's Rapid Growth Project 6. The Board of BHP Billiton approved an investment of $698 million for the development of Orebody 24, which is located about 10 km northeast of Newman and would have an output capacity of 17 Mt/yr in 2012. The development of Orebody 24 also included construction of an ore-crushing plant, a train depot facility, and other associated support facilities. The company planned to build a combined-cycle gas turbine at the Yamima Power Station to replace the existing Newman Power Station in Newman in 2014. Owing to weakened demand for iron ore in the Asia and the Pacific region, the company considered delaying the development of the Outer Harbor at Port Hedland, which was a crucial part for BHP Billiton's plan to increase iron ore production to 440 Mt/yr (BHP Billiton Ltd., 2011a, b; 2012b, p. 5).

Australia-based CITIC Pacific Mining Management Pty Ltd. (a subsidiary of Hong Kong-based CITIC Pacific Ltd., which was, in turn, a member of China's state-owned CITIC Group) had invested about $5 billion to develop its Sino iron ore project at Cape Preston, which is located 100 km southwest of Karratha in Western Australia. The company planned to produce about 21 Mt/yr of 67% iron in concentrates and 6 Mt/yr of pellets in 2011. Concentrates would be moved by conveyor belt to barges and then loaded into offshore vessels at Cape Preston and shipped to China. The company signed up with China Metallurgical Corp. (MCC) (a Chinese state-owned company) as the lead contractor on the development of the project. The company had planned to import Chinese labor to build the mine and facilities; however, because of Australia's stringent visa regulations, the company relied on domestic labor to perform the work instead. MCC faced rising labor costs and a shortage of skilled workers in Australia. The construction cost of the Sino iron ore project increased sharply. Domestic analysts estimated that the construction costs increased to about $7 billion in 2011 from the original forecast of $2.5 billion when the project

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was approved in 2009. Production and export of concentrate was expected to begin in late 2012 (CITIC Pacific Ltd., 2011, p. 22–31; Garvey, 2012).

Hancock Prospecting Pty Ltd. (a privately owned company) had several iron ore projects ongoing in Australia. The company continued with its joint venture with Rio Tinto to develop the Hope Downs Mine. Hancock also planned to develop the Roy Hill 1 iron ore project, which is located 277 km south of Port Hedland. The company completed the bankable feasibility study for the Roy Hill 1 project in 2010 and planned to invest $10 billion for the construction of the mine and infrastructure. Japan's Marubeni Corp. and the Republic of Korea's Pohang Iron and Steel Corp. and STX Corp. agreed to invest about $3.2 billion in the Roy Hill 1 project. Hancock also signed long-term offtake iron ore agreements with China's Yaxin Steel Co. and Shougang International Co., and held discussions with financial institutions from Australia and overseas, including the Export-Import Bank of the United States, for funding the Roy Hill project. The company estimated that Roy Hill had more than 2 billion metric tons (Gt) of iron ore resources. Hancock reported that the indicated and inferred iron ore resource of Roy Hill 1 was 1.2 Gt at an iron cutoff grade of 55%. The company planned to secure funding approval before yearend of 2012 and to mine 55 Mt/yr of direct-shipping iron ore in 2014 (Hancock Prospecting Pty Ltd., 2012).

Crosslands Resources Ltd. announced that the company completed the 5-year pilot Jack Hills project, which is located in 380 km northeast of Geraldton, Western Australia, in 2011. The company exported a total of 6.8 Mt of direct-shipping iron ore to Asian customers. The operation would be placed on care-and-maintenance status in 2012. Crosslands Resources was in the process of completing a feasibility study on the Jack Hills expansion project. The company planned to produce 20 Mt/yr of direct-shipping ore and iron ore concentrates for 39 years. It needed to build processing facilities to optimize the recovery of iron ore and infrastructure facilities, such as for power and water, for the iron ore operation. Japan's Mitsubishi Development Pty Ltd. acquired a stake in Crosslands Resources and Oakajee Port and Rail from Murchison Metals Ltd. (Crosslands Resources Ltd., 2011, 2012).

Bluescope Steel Ltd. announced that the company shut down the No. 6 blast furnace, No. 4 cokemaking battery, No. 3 steelmaking furnace, and No. 1 slab caster at Port Kembla in New South Wales and the Western Port Strip Mill in Victoria in late 2011. The closing of ironmaking and steelmaking facilities would reduce the company's output capacity by 50%. The company's decision was based on the combination of economic challenges, including the record high Australia dollar, low steel prices, and high raw material costs. The company also faced low domestic steel demand and relied on exports for sustaining its output capacity. The economic conditions for exporting steel products from Australia were unlikely to become favorable in the foreseeable future (Bluescope Steel Ltd., 2011).

Lead, Silver, and Zinc.—Australia's lead, silver, and zinc mines were predominantly based on ore bodies with zinc as the major component and lead and silver as byproducts. An exception was BHP Billiton's Cannington underground mine in the State of Queensland, where lead and silver were major components and zinc was a minor component. In 2011, Australian zinc mine production was higher than in 2010. The increased zinc production came from the resumed production of the Century Mine in Queensland and the Golden Grove Mine in Western Australia. The output of zinc was expected to increase during the next 2 years because Xstrata planned to expand the Black Star Open Cut Deeps at the Mount Isa Mine and the Handle Bar Hill Mine and also to develop the Lady Loretta deposit. The State of Queensland remained the leading lead- and zinc-producing State in Australia. In 2011, Australia exported 428,000 t of lead concentrates compared with 525,000 t in 2010. China remained the leading destination for Australian lead concentrate exports and accounted for 35% of the total, which was a decrease from 57% in 2010. Australia's zinc exports to the Republic of Korea increased to 33% in 2011 from 16% in 2010. Japan accounted for 17% of the total, and the remaining 15% went to other countries in the world. Australia also exported 251,000 t of refined lead, for which Malaysia replaced India as the leading destination, followed by the Republic of Korea, India, Thailand, and Vietnam. In 2011, Australia exported 2.4 Mt of zinc concentrates, which was an increase of 5% from that of 2010. Zinc concentrates went mainly to such East Asian countries as China, 42%; the Republic of Korea, 18%; and Japan, 11%. Zinc metal exports increased by about 13% to 452,000 t and went to such destinations as, in descending order of volume exported, China, Taiwan, Hong Kong, the United States, Malaysia, and Indonesia (Australian Bureau of Resources and Energy Economics, 2012a, p. 28, 41).

Xstrata's subsidiary, Xstrata Zinc, operated several lead and zinc mines and a processing plant in Mount Isa, Queensland. The company planned to expand the output capacities of its Black Star open pit mine and George Fisher underground mine. The executive committee of Xstrata approved $246 million to increase the output capacity of the George Fisher Mine. A second hoisting shaft and associated infrastructure to service the northern area of the mine using large-diameter raise boring technology was involved. An existing shaft servicing the northern end of the mine would be lined and extended by 420 m to a depth of 1,140 m. Zinc reserves in the mine had increased to 70 Mt in 2010 from 33 Mt in 2003 when Xstrata acquired the operation. After completion in 2013, the output of the George Fisher underground mine would increase to 4.5 Mt/yr from 3.5 Mt/yr. The company planned to mine ore at a depth of 400 m below the surface, or 100 m below the current design of the Black Star open pit mine, and the life of the mine at the current rate of 4.6 Mt/yr would be extended to 2016. The executive committee of Xstrata also approved $239 million to develop the Lady Loretta lead-silver-zinc deposit in northwestern Queensland. The deposit, which is located 140 km northwest of the Mount Isa operation, had mineral resources of 13.7 Mt grading 17% zinc and 6% lead. The construction of the mine started in 2011 and was scheduled to be completed in 2013. Lady Loretta was designed to produce 1.2 Mt/yr of ore and an average of 141,000 t/yr of zinc in concentrate and 44,000 t/yr lead in concentrate for 10 years. Ore from these mines would be processed at the Mount Isa concentrator. Xstrata also decided to expand the Handlebar Hill Mine's production capacity; the mine is located 20 km north of Mount Isa. Around the Mount Isa

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surrounding areas, Xstrata had zinc resources of 600 Mt of ore and 36 Mt of contained zinc (Xstrata Zinc Australia, 2010; 2011; 2012; Xstrata plc, 2012, p. 18).

Owing to declining metal prices in Australia and a series of technical problems, Bass Metals Ltd. decided to shut down its Hellyer operation in Tasmania and placed it on care-and-maintenance status in 2012. The company agreed to sell its wholly owned subsidiary Hellyer Mill Operations Pty Ltd. to LionGold Corp. Ltd. of Singapore for $13.5 million; the transaction was expected to be completed in mid-2012. In 2011, the company produced 29,051 t of zinc concentrates at a grade of 48% zinc and 13,647 t of lead concentrates at a grade of 51% lead. The company also produced various amounts of copper, gold, and silver (Base Metals Ltd., 2011a, p. 1; 2011b, p. 5; 2011c, p. 7; 2012a, p. 7; 2012b, p. 1).

Tantalum.—In August 2007, Talison Minerals Pty Ltd. of Canada acquired the Greenbushes and the Wodgina Mines in Western Australia from Sons of Gwalia Ltd. In 2009, Talison Minerals placed its lithium and tantalum operations into two separate companies—Talison Lithium Ltd. and Talison Tantalum Ltd. Talison Minerals had suspended its Wodgina tantalum operation beginning in December 2008 because lower priced tantalum from central Africa, particularly from the Democratic Republic of the Congo [Congo (Kinshasa)], supplied a significant amount of tantalum to the world market. The Greenbushes tantalum underground operation also remained on care-and-maintenance status in 2009. In 2010, Talison Tantalum Ltd. was renamed Global Advanced Metals Pty Ltd., and Global Advanced Metals reopened the Greenbushes and Wodgina operations in 2011. The Wodgina operation had a capacity to produce more than 600 t/yr of tantalum pentoxide from tantalum-bearing pegmatite ore at the Mount Cassiterite and the South Tinstone open cut mines. The Wodgina processing plant produced primary tantalum concentrate grading between 8% and 19% tantalum pentoxide, which was transported to the Greenbushes plant for secondary processing to produce salable tantalum products. Global Advanced Metals signed a 5-year purchase agreement with Galaxy Resources Ltd. for tantalum concentrate from its Mount Cattlin Mine (Global Advanced Metals Pty Ltd., 2011).

Tin.—Compared with other tin-producing countries in the Asia and the Pacific region, Australia was not a significant tin producer. Australia's tin was mined mainly in Tasmania, and to a lesser extent, in Western Australia. Tin production was mainly from Iluka Resources Ltd.'s heavy mineral sand operation in Western Australia, but the company had not released any tin preconcentrate information. In Tasmania, tin was produced from Metal X Ltd.'s tin operations. Tin concentrates were smelted at Global Advanced Metals' Greenbushes smelter, which had been closed in 2007 but was reopened in 2011. No primary refined tin was produced. In 2011, Australia exported 11,049 t of tin concentrates and 19 t of refined tin and imported 676 t of refined tin (Australian Bureau of Resources and Energy Economics, 2012a, p. 38).

In 2010, Metals X sold 50% of its interest in its Tasmanian tin assets to Yunnan Tin Group of China. The two parties established a joint-venture company, Bluestone Mines Tasmania Joint Venture Pty Ltd., to manage the assets. The joint venture planned to mine ore from both the North Renison and the South Renison declines at a rate of about 60,000 t/mo in 2012 to replace the depleted tin resources in the Mount Bischoff Mine, which ceased operations at yearend 2010 and was placed on care-and-maintenance status in 2011. The joint venture estimated that the Renison underground mine had mineral resources of 8.35 Mt grading 1.63% tin in 2011. The joint venture planned to reprocess and recover tin from an estimated 18.95 Mt of tailings at the historic Renison site. The tailings contained average grades of 0.44% tin and 0.20% copper. The joint venture planned to process 2 Mt/yr of tailings to produce 5,300 t/yr of tin and 2,000 t/yr of copper. The beneficiated material contained 10% tin and could be smelted to produce a 68% tin fume product. Metal X planned to sell its Collingwood tin operation near Cooktown, Queensland; the Collingwood operation was on care-and-maintenance status in 2011 (Metals X Ltd., 2012, p. 11–16).

Industrial Minerals

Cement.—Australia had three major integrated cement companies (Adelaide Brighton Cement Pty Ltd., Blue Circle Southern Cement Ltd., and Cement Australia Pty Ltd.) and a number of small independent companies. The three major cement companies accounted for all integrated production of clinker and cement in Australia. Domestic clinker capacity was about 8 Mt/yr and cement capacity was about 10 Mt/yr. The highly efficient dry precalciner technology accounted for 85% of Australia's cement production. During the past several years, the three integrated cement producers produced about 9 Mt/yr for the domestic market. Small independent producers used imported clinker from Asian countries to produce cement and accounted for about 15% of the domestic supply of cement. The Government implemented a carbon tax in 2011 that affected the cement sector in Australia. Carbon dioxide is emitted as a product of the chemical reaction during clinker production. To reduce carbon dioxide emission, some Australian cement plants were required to technically upgrade their production plants or relocate their operations overseas. In 2007, Cement Australia Pty Ltd. invested $10 million to improve its Kandos plant in New South Wales and stabilize the workforce owing to a shortage of skilled workers. The company decided to shut down its Kandos plant in 2011. The Government planned to introduce a Coastal Trading Bill in 2012 that would increase transshipping costs for dry bulk commodities, such as cement (Cement Australia Pty Ltd., 2011; Cement Industry Federation, 2012, p. 5).

Lithium.—As of March 2011, Talison Lithium's lithium resource at Greenbushes was 31.4 Mt at an average grade of 3.1% lithium oxide, and the estimated life of the Greenbushes Mine was increased to 22 years. The two ore treatment plants at the facility had a combined total output capacity of 600,000 t/yr to produce about 260,000 t/yr of lithium concentrates that contained about 15% lithium carbonate equivalent. In 2010, the company completed the stage 1 expansion to increase the output capacity at the Greenbushes operation to about 315,000 t/yr of lithium concentrate (about 47,000 t/yr of lithium carbonate). In recent years, demand for chemical-grade and technical-grade

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lithium concentrates had increased, especially from customers in China. Talison Lithium invested $65 million to double the output capacity to 740,000 t/yr of lithium concentrate (about 110,000 t/yr lithium carbonate). The construction of the stage 2 expansion started in 2011 and was to be completed in the second quarter of 2012. Owing to increased demand for lithium carbonate in the global market, Talison planned to build a minerals conversion plant in the Kwinana Industrial Area, which is located 40 km south of Perth and 200 km northeast of the Greenbushes operation in Western Australia. The company planned to perform an engineering study of a 20,000-t/yr lithium carbonate plant in early 2012. Talison and Japan's Mitsui and Co. Ltd. and Sojitz Corp. had discussed collaborative marketing and distribution of lithium carbonate in Japan on a nonexclusive basis (Talison Lithium Ltd., 2011; 2012, p. 6).

In 2011, Galaxy Resources completed the construction of its Mount Cattlin Mine, which is located 2 km north of Ravensthorpe in Western Australia. The Mount Cattlin Mine had total ore resources (measured, indicated, and inferred) of 17.2 Mt grading 1.09% lithium oxide and 155 ppm tantalum oxide. The mined pegmatite ore was processed onsite to produce a spodumene concentrate and a tantalum byproduct. The processing plant was designed to process 1 Mt/yr of ore to produce about 137,000 t/yr of spodumene concentrate grading 6% lithium oxide and 25 t/yr (56,000 pounds per year) of contained tantalum oxide for 18 years. Galaxy Resources exported its spodumene concentrate to its lithium carbonate plant in China (Galaxy Resources Ltd., 2012, p. 15).

Magnesium Compounds.—All Australian magnesite deposits were mined by the open pit method. The Queensland Magnesia Pty Ltd.'s Kunwarara Mine, which is located 70 km northwest of Queenstown in Queensland, was the largest operating magnesite mine in the country. About 3 Mt/yr of ore was mined and processed at Kunwarara. The beneficiated magnesite was transported to the company's Parkhurst plant for calcination to produce the required magnesia products, such as high-grade deadburned, electrofused, and calcined. The Parkhurst plant had a designed capacity of 320,000 t/yr. In recent years, the Parkhurst plant operated at about 30% of its designed capacity. Sibelco Group of Belgium acquired Queensland Magnesia in 2012 (Register of Australian Mining, 2012, p. 201).

Latrobe Magnesium Ltd. completed a feasibility study to build a magnesium plant in Latrobe Valley, Victoria. The company planned to extract magnesium from fly ash from a coal powerplant. Latrobe planned to use the hydromet process, which was developed by Ecoengineers Pty Ltd., to remove the majority of iron, silicon, and sulfur from the ash. The beneficiated material could be used as feedstock in the thermal reduction process. Results from pilot plant operation indicated that the magnesium recovery rate was about 95%. Initial design was to produce 10,000 t/yr of magnesium metal at a cost of $100 million; however, engineering designers recommended that reducing the size of the commercial plant to 5,000 t/yr could reduce capital costs to $35 to $40 million. The demonstration plant was expected to be commissioned in 2014. Australia relied on imported magnesium for its domestic consumption, which was about 10,000 t/yr (Latrobe Magnesium Ltd., 2012a, b).

Rare Earths.—China dominated the production and resources of rare earths in the world. Lynas Corp. Ltd. started construction of an open pit mine and a concentration plant at the Mount Weld deposit in 2007; the deposit was located 35 km south of Laverton, Western Australia, and started mining at the Central Lanthanide pit in 2010. The construction of the concentration plant started in 2010 and the plant was put into operation in 2011 to produce at a target grade of 36% rare-earth oxide (REO) in concentrates; the recovery rate was expected to be 68.7%. The plant was designed to process 121,000 t/yr of ore and to produce 33,000 t/yr of rare-earth concentrate. In 2011, the company reported stockpile ore valued at A$21.2 million (US$22.2 million). The first feed of ore to the concentration plant was to be in May 14, 2011. Lynas planned to double its processing capacity by yearend 2012. Rare-earth concentrates were shipped to Lynas' advanced materials plant in Kuantan, Malaysia. Lynas planned to develop the Duncan deposit, which is located southeast of the central lanthanide deposit. The mineral resource at Duncan was estimated to be 8.9 Mt grading 4.8% rare earth oxide (REO). The Duncan deposit could be exploited using the opencut mining method. The cost of development the Duncan deposit was estimated to be $600 million. Lynas and Sojitz Corp. of Japan formed a strategic alliance and signed an offtake, distribution, and financing agreement to enable Lynas to accelerate the development of the phase 2 operation. Under the agreement, Sojitz was allocated a minimum of 8,500 t/yr of rare-earth products for the Japanese market for 10 years (Lynas Corp. Ltd., 2012a, p. 8–16; 2012b, p. 7).

Arafura Resources Ltd.'s Nolans Bore rare-earth deposit is located about 10 km west of the Stuart Highway near Aileron Roadhouse in the Northern Territory. The company planned to use the sulfation process to recover rare earths and phosphate using its patented preleach process. The Nolans Bore deposit had measured, indicated, and inferred resources of 47 Mt at an average grade of 2.6% REO, 11% phosphorus pentoxide, and 0.41% uranium oxide. The light rare-earth elements (lanthanum, cerium, praseodymium, neodymium, and samarium) accounted for 96.7% of the total. In 2011, the company was preparing a feasibility study for the Nolans Bore project. Arafura Resources planned to mine 7 Mt/yr of ore for the first 8 years of operation and to increase that amount to 15 Mt/yr to produce an average of 1.5 Mt/yr of concentrate. The concentrate would be transported to the Whyalla Rare Earth Complex in South Australia. The designed annual output capacities were 500,000 t of gypsum, 80,000 t of phosphoric acid, 20,000 t of REOs, and 150 t of uranium in 2013. In 2009, Arafura and Jiangsu Eastern China Non-Ferrous Metals Holding Co. (a subsidiary of East China Exploration and Development Bureau) reached a $24 million equity investment agreement. According to the agreement, Jiangsu Eastern China could acquire up to 25% interest in Arafura Resources. The company also signed a strategic offtake agreement with ThyssenKrupp AG of Germany in 2011 and Republic of Korea companies in 2012 (Arafura Resources Ltd., 2012, p. 3–11).

Talc.—In 2001, Rio Tinto (through its subsidiary Luzenac Australia Pty Ltd.) acquired the Three Springs talc operation, which is located in Western Australia, from WMC Resources Ltd.

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The mine had an output capacity of 200,000 t/yr of talc. In 2010, Rio Tinto invested $11 million to replace the Three Springs' beneficiation plant. The new plant had the capacity to produce up to 150,000 t/yr of high-specification products. Owing to the global financial crisis, Rio Tinto put its borate and talc business up for sale and received a binding offer from a France-based company, Imerys SA, for its talc business. The European Commission approved the acquisition of Rio Tinto's talc business by Imerys, and the transaction was completed in 2011 (European Commission, 2011; Rio Tinto plc., 2011).

Mineral Fuels and Related Materials

Coal.—Australia ranked behind China and India in the Asia and the Pacific region in coal output; the country, however, was the world's leading exporter of coal. Queensland and New South Wales were Australia's leading coal-producing States and accounted for more than 95% of the country's total output. In 2011, Australia mined 468 Mt of raw black (bituminous and anthracite) coal, of which 349 Mt was salable coal. Underground coal mines accounted for about 79% of the total output. Queensland's coal output accounted for 52.7% of the country's total output and was mainly from the Bowen Basin, which extends south from Collinsville to Blackwater and Moura, and from mines at Blair Athol, Newlands, and near Brisbane. New South Wales' coal output accounted for 45.3% of the country's total output and was mined near the eastern and western edges of the large Sydney Gunnedah Basin. Australia exported more than 280.6 Mt of coal (metallurgical coal, 133.0 Mt, and thermal coal, 147.6 Mt) compared with 300.3 Mt in 2010. Japan was the leading destination for Australian metallurgical coal, 30.7%; followed by India, 21.8%; the Republic of Korea, 6.7%; China, 5.3%; and others, 35.5%. Japan was also the leading destination for Australian thermal coal, 44.3%, followed by the Republic of Korea, 20.0%; Taiwan, 12.9%; China, 11.3%; and others, 11.5%. Domestic coal consumption was less than 70 Mt, of which the power sector accounted for about 85%, followed by steel, 6.7%; cement, 1.3%; and other, 7%. Owing to increased demand from its fellow countries in the Asia and the Pacific region, such as China and India, Australia's metallurgical coal exports were expected to increase during the next several years (Australian Bureau of Resources and Energy Economics, 2012a, p. 22).

BHP Billiton approved funding for the development of the Caval Ridge project and the expansion of the Peak Downs Mine in the Bowen Basin in Queensland. The total investment was $4.2 billion, of which BHP Billiton's share was $2.1 billion. BHP Billiton's partner, Mitsubishi Development Pty Ltd. of Japan provided the remaining funds. The Caval Ridge Mine would have the capacity to produce 5.5 Mt/yr of metallurgical coal, and the capacity of the Peak Downs Mine would increase by 2.5 Mt for more than 60 years. The Caval Ridge project was one of the four components of the BHP Billiton Mitsubishi Alliance Coal Operations Pty Ltd. in the Bowen Basin coal growth project. The Daunia Mine, which was a new open pit coal mine and coal handling preparation plant, was scheduled to be completed in 2013; the plant would have the capacity to produce 4 Mt/yr of coal for 21 years (BHP Billiton Ltd., 2011b).

In 2010, the Board of Xstrata approved $1.36 billion for the development of the Ravensworth North open pit coal mine in the Upper Hunter Valley of New South Wales. The construction of the mine started in 2011 and was scheduled to be completed in mid-2012. The mine was designed to produce 8 Mt/yr of thermal coal for 26 years. The mine was situated within the existing Cumnock Coal Mine and Ravensworth complex. Xstrata planned to export its coal output (Xstrata Coal, 2010).

Rio Tinto decided to close down it Blair Athol coal mine near Clemont, Queensland, at yearend 2012 after almost 30 years of operation. The decision to close the mine was owing to the drop in coal prices and the increase in production costs (Rio Tinto Ltd., 2012a).

Uranium.—Australia was the third ranked uranium producer in the world after Kazakhstan and Canada. Australia's uranium production was mainly from three mines—the Beverley, the Olympic Dam, and the Ranger. A number of undeveloped deposits also occur in the Northern Territory, Queensland, South Australia, and Western Australia. The Australian Government permits uranium mining, provided that all the relevant environmental safeguards and health requirements are met. Regulation of Australia's uranium mines is mainly a State and Territorial government responsibility. Australia exported all its uranium output under long-term contracts. High rainfall in the Northern Territory affected the output of the Ranger Mine in 2011. Australia's uranium production was expected to increase during the next several years. The Honeymoon project, which was a joint venture of Uranium One Inc. of Canada (51%) and Mitsui & Co. Ltd. of Japan (49%), is located 75 km northwest of Broken Hill, South Australia. The Honeymoon deposit had indicated resources of 1.2 Mt at an average grade of 0.24% uranium oxide. The company planned to produce 400 t/yr (880,000 pounds per year) of uranium oxide for 6 years. The mine produced 38 t (100,000 pounds) of uranium in 2011. Uranium One planned to add 96 production wells in 2012 to achieve the production target. Mitsui announced that the company decided to withdraw from the joint venture and was waiting for the Australian Government's approval. Other new projects, which were under feasibility study, included Mega Uranium Ltd.'s Lake Maitland project in Western Australia and Marathon Resources Ltd.'s Mount Gee project in South Australia. Owing to rising investment costs and low commodity prices, BHP Billiton decided to delay its $30 billion Olympic Dam expansion plan (BHP Billiton Ltd., 2012a; Uranium One Inc., 2012, p. 22).

Outlook

Australia is a natural-resource-rich country with significant resources of metallic, nonmetallic, and fuel minerals. Mineral and energy commodity exports are an important part of the country's economy. Reflecting strong world demand for mineral commodities, especially in the Asia and the Pacific region, the Australian economy is expected to continue to benefit from higher commodity export earnings. Expenditures on mineral and energy exploration in Australia are expected to increase owing to higher costs of labor and equipment and global demand for mineral resources in the near future. Production of such mineral commodities as bauxite, copper, iron ore,

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natural gas, nickel, and zinc during the next several years was expected to increase much more slowly than in the past several years. Major projects, such as the Yarwun alumina refinery project; BHP Billiton's RGP iron ore project; Hamersley Iron's Yandicoogina iron ore expansion; Fortescue Metals' iron ore project; Rio Tinto's Brockman 4, Hope Downs, and Mesa A iron ore projects and Clermont and Kestrel coal projects; and Xstrata's Mangoola coal project, are expected to come onstream within this decade. If the slow economic recovery in the United States and European Union continues, the volume of imports of mineral products from China and other Asia countries to these countries is expected to decline. China also plans to slow down its economic growth to 7% to 8% in the next several years from 10% during the past 10 years, as a result, China's demand for mineral commodities from Australia is expected to decrease, and companies could, therefore, delay their investment in these projects. Western Australia is Australia's leading State for metallic mineral exports and New South Wales and Queensland are its major coal exporting States; however, to sustain export growth, the country's infrastructure would require significant expansion and upgrading so that minerals for export could be transported from inland to port terminals. A carbon tax and mineral resource rent tax would not affect Australian mineral investment significantly. Australia is expected to remain a major mineral and fuel exporting country.

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TABLE 1
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless othewise specified)

Commodity		2007	2008	2009	2010	2011
METALS						
Aluminum:						
Bauxite, gross weight	thousand metric tons	62,398	64,038	65,231	68,414	69,976
Alumina	do.	18,844	19,446	19,948	19,956	19,399
Metal:						
Primary	do.	1,957	1,974	1,943	1,928	1,945
Secondary[e]		130,000	130,000	130,000	130,000	130,000
Antimony, Sb content of ores and concentrates[e]		1,010	1,500	1,000	1,106 [r, 2]	1,577 [2]
Cadmium:[e]						
Mine output, Cd content		700	700	460 [r]	-- [r]	--
Metal, smelter, refined		350	330	330	310	390
Chromium, chromite, gross weight		253,400	224,809	119,314	-- [r]	--
Chromite content[e]		103,000	90,000	45,000	-- [r]	--
Cobalt:						
Co content in laterite ore, Ni concentrate, and Zn concentrate[e]		4,730	4,780	4,345 [2]	3,850	4,000
Metal, refined		3,680	3,620	4,050	4,120	4,000 [e]
Copper:						
Mine output, Cu content	thousand metric tons	870	885	859	870 [r]	958
Metal:						
Smelter, primary and secondary	do.	399	447	422	410 [r]	402
Refined, primary	do.	442	503	446	417	477
Gold:						
Mine output, Au content		247	215	224	261	260
Metal, refined:						
Primary		259	244	256	280	271
Secondary		116	117	123	71	48
Iron and steel:						
Iron ore:[e]						
Gross weight	thousand metric tons	299,000	342,000	394,000	433,000	488,000
Fe content	do.	186,000	208,000	228,000	271,000	277,000
Metal:						
Pig iron	do.	6,351	6,409	4,370	6,259	6,400 [e]
Ferroalloys:[e]						
Ferromanganese		115,000	147,000	87,000	138,000 [r]	146,000
Silicomanganese		110,000	125,000	74,000	131,000 [r]	130,000
Total		225,000	272,000	161,000	269,000 [r]	276,000
Steel, crude	thousand metric tons	8,047	7,724	5,135	7,408 [r]	6,538
Semimanufactured products[e]		7,130	10,200	7,530	8,000	8,000
Lead:						
Mine output, Pb content	thousand metric tons	641	645	566	625	621
Metal:						
Bullion	do.	125	167	150	142	139
Refined:						
Primary	do.	202	220	204	178	187
Secondary, excluding remelt	do.	27	24	25	26	26
Manganese ore, metallurgical:						
Gross weight	do.	5,265	4,812	4,451	6,474 [r]	6,963
Mn content	do.	2,540	2,310	2,140	2,650 [r]	2,860
Nickel:						
Mine output, Ni content	do.	160	188	165	170	212
Matte	do.	42	31	28	54	57
Metal, smelter, refined Ni and Ni content of oxide	do.	114	103	131	108	110
Platinum-group metals:[e]						
Palladium, Pd content	kilograms	600	580	800	650	600
Platinum, Pt content	do.	142	120	230	130	130
Total	do.	742	700	1,030	780	730
Silver:						
Mine output, Ag content		1,879	1,926	1,633	1,864	1,725
Metal, refined		625	644	664	735	898

See footnotes at end of table.

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TABLE 1—Continued
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011
METALS—Continued						
Tantalum, tantalite, Ta_2O_5 equivalent		538	680	105	--	--
Tin:						
Mine output, Sn content[3]		2,071	1,783	5,630	6,600 r	6,000 e
Metal, refined:						
Primary		118	170	-- r	-- r	--
Secondary[e]		400	400	400	400	400
Titanium concentrates, gross weight:						
Ilmenite	thousand metric tons	2,340	2,082	1,449	1,492	1,277
Leucoxene[e]		163,000	148,000	162,000	159,000	224,000
Rutile		312,000	325,000	285,000 r	429,000 r	474,000
Tungsten, mine output, W content		7	28	33	16	15
Zinc:						
Mine output, Zn content	thousand metric tons	1,514	1,519	1,290	1,479	1,515
Metal, smelter:						
Primary	do.	502	499	525	499	507
Secondary[e]		6,000	6,000	6,100	6,000	6,000
Zirconium concentrates, gross weight	thousand metric tons	601	514 r	400 r	549 r	762
INDUSTRIAL MINERALS						
Abrasives, natural:						
Beach pebble[e]		2,000	2,000	2,000	2,000	2,000
Garnet		294,007	298,290	275,560	196,839	200,000
Barite[e]		17,000 r	17,000 r	12,000 r	12,000 r	12,000
Cement, hydraulic[e]	thousand metric tons	9,200	9,400	9,200	8,300 r	8,600
Clays:[e]						
Bentonite and bentonitic clay		220,000	220,000	220,000	230,000	230,000
Brick clay and shale	thousand metric tons	8,000	8,000	8,000	8,000	8,000
Cement clay and shale	do.	500	500	500	500	500
Damourite clay		100	100	100	100	100
Fire clay		22,000	22,000	22,000	22,000	22,000
Fuller's earth, attapulgite		10,000	10,000	10,000	10,000	10,000
Kaolin and ball clay		230,000	230,000	230,000	240,000	240,000
Other	thousand metric tons	2,000	2,000	2,000	2,000	2,000
Diamond:						
Gem	thousand carats	231	273	220	100	86
Industrial	do.	18,960	15,397	10,575	9,900	7,500
Total	do.	19,191	15,670	10,795	10,000	7,586
Diatomite[e]		20,000	20,000	20,000	20,000	20,000
Feldspar, including nepheline syenite[e]		50,000	50,000	50,000	50,000	50,000
Gemstones, opal[e]	value, $million	40	41	33 r	40 r	40
Gypsum	thousand metric tons	3,896	3,734	3,436 r	3,000 r,e	3,000 e
Kyanite[e]		1,000	1,000	1,000	1,000	1,000
Lime[e]		1,600,000	2,200,000	2,000,000	2,000,000	2,000,000
Lithium, spodumene		192,277	239,528	197,482	295,000	357,543
Magnesite		447,000	126,000	344,000	300,000 e	300,000 e
Nitrogen, N content of ammonia		1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Perlite, crude[e]		6,500	6,500	6,500	7,000	7,000
Phosphate rock:[e]						
Gross weight		2,850,000	2,950,000	2,500,000	2,600,000	2,600,000
P_2O_5 content		655,000	678,000	575,000	600,000	600,000
Rare earths, rare-earth oxide equivalent		--	--	--	--	2,188
Salt[4]	thousand metric tons	10,855	11,160	10,316	11,968	11,744
Soda ash[e]	do.	310	310	310	310	310
Stone and sand and gravel:						
Construction sand	do.	35,530	37,000	34,000 e	35,000 e	35,000 e
Crushed and broken stone[e]	do.	95,000	110,000	115,000	100,000 r	100,000
Dimension stone	do.	190	230 e	180 r,e	170 r,e	170 e

See footnotes at end of table.

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TABLE 1—Continued
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011
INDUSTRIAL MINERALS—Continued						
Stone and sand and gravel—Continued:						
Gravel[e]	thousand metric tons	13,600	12,000	12,000	12,000	12,000
Dolomite[e]	do.	10,000	10,000	10,000	10,000	10,000
Limestone[e]	do.	19,100	18,400	16,800 r	17,000 r	18,000
Silica in the form of quartz, quartzite, glass sand[e]	do.	5,300	5,500	5,000 r	5,100 r	5,300
Sulfur, byproduct:[e]						
Metallurgy	do.	880	880	870	800	800
Petroleum	do.	58	60	60	60	60
Total	do.	938	940	930	860	860
Talc, chlorite, pyrophyllite, steatite[e]		125,000	120,000	120,000	120,000	120,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, salable:						
Bituminous and subbituminous	thousand metric tons	320,000	332,000	348,000	449,000	468,000
Lignite[e]	do.	71,000	71,000	74,000 r	71,000 r	65,000
Total[e]	do.	391,000	403,000	422,000	520,000	533,000
Gas, natural, marketed	million cubic meters	39,960	38,256	42,345	51,868 r	51,253
Petroleum:						
Crude, includes condensate	thousand 42-gallon barrels	170,470	168,123	169,211	169,985	143,456
Refinery products	do.	252,443	246,717	241,233	235,971	239,618
Uranium, mine output, U_3O_8 content		10,145	9,989	7,942	7,440	6,942

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.
[1]Table includes data available through August 1, 2012.
[2]Reported figure.
[3]Does not include tin production from heavy mineral sand in Western Australia.
[4]Does not include production from Northern Territory and Victoria.

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TABLE 2
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Aluminum:			
Bauxite	Gove open pit bauxite mine [Pacific Aluminum (Rio Tinto Ltd., 100%)]	15 km southeast of Nhulunbuy, NT	8,000
Do.	Huntly open pit bauxite mine (Alcoa World Alumina Australia, 100%)	80 km south of Perth, WA	20,000
Do.	Weipa-Andoom open pit bauxite mine [Comalco Ltd., operator (Rio Tinto Alcan, 100%)]	Weipa, QLD	21,000
Do.	Willowdale open pit bauxite mine (Alcoa World Alumina Australia, 100%)	130 km south of Perth, WA	8,600
Do.	Boddington-Worsley open pit bauxite mine {Worsley Alumina Pty. Ltd., manager [BHP Billiton Ltd., 86%; Japan Alumina Associates (Australia) Pty. Ltd., 10%; Sojitz Alumina Pty. Ltd., 4%]}	14 km south of Boddington, WA	13,200
Alumina, refinery	Gladstone alumina refinery [Queensland Alumina Ltd., operator (Rio Tinto Alcan, 80%, and United Company RUSAL 20%)]	Gladstone, QLD	3,850
Do.	Gove alumina refinery {Alcan Gove Pty Ltd. [Pacific Aluminum, 100% (Rio Tinto Ltd., 100%)]}	Nhulunbuy, Gove, NT	3,800
Do.	Kwinana alumina refinery (Alcoa World Alumina Australia, 100%)	Kwinana, WA	2,100
Do.	Pinjarra alumina refinery (Alcoa World Alumina Australia, 100%)	Pinjarra, WA	4,200
Do.	Wagerup alumina refinery (Alcoa World Alumina Australia, 60%, and Western Mining Corp., 40%)	Waroona, WA	2,600
Do.	Worsley alumina refinery {Worsley Alumina Pty. Ltd., manager [BHP Billiton Ltd., 86%, and Japan Alumina Associates (Australia) Pty Ltd., 10%]}	20 km northwest of Collie, WA	3,500
Do.	Yarwun alumina refinery (Rio Tinto Alcan, 100%)	Gladstone, QLD	1,400
Metal smelter	Bell Bay aluminum smelter [Pacific Aluminum (Rio Tinto Ltd., 100%)]	Bell Bay, TAS	160
Do.	Boyne Island aluminum smelter [Boyne Smelters Ltd., operator [Pacific Aluminum, 64% (Rio Tinto Ltd., 100%); Sumitomo Light Metal Industries Ltd., 17%; Ryowa Development Pty. Ltd., 12%; Kobe Steel Ltd., 5%; Sumitomo Chemical Co. Ltd., 2%]	Boyne Island, QLD	550
Do.	Point Henry aluminum smelter (Alcoa of Australia, 100%)	Point Henry, VIC	185
Do.	Portland aluminum smelter [Alcoa of Australia, 55%, manager; China International Trust Investment Co. (China state-owned company), 22.5%; Marubeni Australia Pty. Ltd., 22.5%]	Portland, VIC	345
Do.	Tomago aluminum smelter {Tomago Aluminium Co. Pty. Ltd., operator [Gove Aluminium Finance Ltd., 36.05%; Pacific Aluminum 51.55% (Rio Tinto Ltd., 100%); Hydro Aluminium, 12.40%]}	Tomago, NSW	525
Antimony	Costerfield underground antimony-gold mine [AGD Mining, operator (Mandalay Resources Ltd., 100%)]	50 km east and southeast of Bendigo, VIC	5
Do.	Hillgrove Mine (Straits Resources Ltd., 100%)	25 km east of Armidale, NSW	10
Bentonite	Arumpo open pit bentonite mine (Arumpo Bentonite Pty. Ltd., 100%)	95 km northeast of Mildura, NSW	10
Do.	Cedars open pit bentonite mine (PCP Douglass Pty. Ltd., 100%)	10 km southwest of Yarraman, QLD	20
Do.	Cressfield open pit bentonite mine (Unimin Australia Ltd., 100%)	20 km north of Scone, NSW	12
Do.	Mantuan Downs (Pacific Enviromin Ltd., 100%)	West of Springsure, QLD	100
Do.	Miles open pit bentonite mine (Unimin Australia Ltd., 100%)	350 km west of Brisbane, QLD	100
Cement, plant	Adelaide Brighton Cement Pty Ltd., 100%	Angaston, SA	250
Do.	do.	Birkenhead, SA	1,200
Do.	do.	Geelong, VIC	800
Do.	do.	Munster, SA	590
Do.	Blue Circle Southern Cement Ltd., 100%	Berrima, NSW	1,200
Do.	do.	Maldon, NSW	700
Do.	do.	Waurn Ponds, VIC	250
Do.	Cement Australia Pty Ltd. (Hanson Ltd. and Holcim Australia Pty Ltd.)	Brisbane, QLD	1,200
Do.	do.	Gladstone, QLD	1,700
Do.	do.	Railton, TAS	1,000
Do.	Cockburn Cement Ltd., 100%	Munster, 30 km south of Perth, WA	700
Chromite	Coobina open pit chromite mine (Palmary Enterprises Ltd., 100%)	80 km southeast of Newman, WA	250

See footnotes at end of table.

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TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Coal	Angus Place longwall coal mine (Centennial Coal Co. Ltd., 50%, and SK Corp., 50%)	16 km northwest of Lithgow, NSW	3,000
Do.	Appin longwall coal mine [Illawarra Coal Holdings Pty Ltd., operator (BHP Billiton Ltd., 100%)]	40 northwest of Wollongong, NSW	8,800
Do.	Ashton open pit/underground coal mine (Felix Resources Ltd., 60%; Chu Corp., 10%; private, 30%)	14 km northwest of Singleton, NSW	4,000
Do.	Awaba underground coal mine [Powercoal Pty. Ltd., operator (Centennial Coal Co. Ltd., 100%)]	30 km southwest of Newcastle, NSW	2,000
Do.	Baal Bone coal mine [Oakbridge Pty. Ltd., 74.1% (Xstrata plc, 100%); Sumitomo Corp., 5%; Toyota Tsusho Mining (Australia) Pty Ltd. 4.75%; private, 14.44%]	24 km northwest of Lithgow, NSW	2,500
Do.	Bengalla open pit coal mine [Coal and Allied Industries Ltd., 40%, manager; Wesfarmers Bengalla Ltd., 40%; MCDA Bengalla Investment Pty. Ltd., 10%; Taipower Bengalla Pty. Ltd., 10%]	5 km west of Muswellbrook, NSW	6,600
Do.	Blackwater open pit coal mine (includes South Blackwater) [BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)]	195 km west of Rockhampton, QLD	14,000
Do.	Broadmeadow open pit/underground coal mine [BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)]	30 km north of Moranbah, QLD[3]	3,000
Do.	Bulga open pit coal mine [Oakbridge Pty Ltd., manager (Xstrata plc, 68.25%; Nippon Steel Australia Pty. Ltd., 12.5%; Toyota Tsusho Mining (Australia) Pty Ltd., 4.38%; private, 13.3%]	16 km southwest of Singleton, NSW	10,000
Do.	Burton open pit coal mine (Peabody Energy Corp., 95%, and Thiess Pty. Ltd., 5%)	150 km southwest of Mackay, QLD	5,800
Do.	Callide coal mine (Anglo Coal Pty Ltd., 100%)	120 km southwest of the Port of Gladstone, QLD	10,700
Do.	Camberwell open pit coal mine [Camberwell Coal Pty. Ltd., manager [Toyota Tsusho Mining (Australia) Pty. Ltd., 90%, and Dia Coal Mining (Australia) Pty Ltd., 10%]	10 km northwest of Singleton, NSW	4,000
Do.	Clarence underground coal mine [Centennial Coal Co. Ltd., 85%, (manager) and SK Australia Pty. Ltd., 15%]	10 km east of Lithgow, NSW	2,500
Do.	Commodore open pit coal mine Roche Mining Pty. Ltd., operator [Intergen (Australia) Pty Ltd., 100%]	80 km southwest of Toowoomba, QLD	3,600
Do.	Coppabella open pit coal mine (Macarthur Coal Ltd., 73.3%, and others, 26.7%)	140 km southwest of Mackay, QLD	4,000
Do.	Cumnock No. 1 open pit coal mine (Cumnock Coal Ltd., 100%)	28 km northwest of Singleton, NSW	3,000
Do.	Curragh open pit coal mine (Wesfarmers Ltd., 100%)	70 km east of Emerald, QLD	9,000
Do.	Dartbrook coal mine (Anglo Coal Holdings Australia Ltd., 77.3%)	70 km north of Singleton, NSW[3]	3,750
Do.	Dawson coal complex (includes Moura, Theodore, and Taroom) [Anglo American plc, 51%, and Mitsui & Co. (Australia) Ltd., 49%]	230 km west of Bundaberg, QLD	7,000
Do.	Dendrobium underground coal mine (BHP Billiton Ltd., 100%)	15 km southwest of Wollongong, NSW	5,200
Do.	Donaldson open pit coal mine (Donaldson Coal Pty Ltd., 100%)	5 km southeast of Maitland, NSW	2,500
Do.	Drayton open pit coal mine [Anglo Coal Holdings Australia Ltd., 88.2%, manager; Mitsui Coal Development Australia Pty. Ltd., 3.8%; Mitsui Mining (Australia) Pty. Ltd., 3%; others, 5%]	35 km northwest of Singleton, NSW	5,000
Do.	Duralie open pit coal mine (Gloucester Coal Ltd., 100%)	110 km of Newcastle, NSW	2,000
Do.	Elouera underground coal mine (Gujarat NRE Resources NL, 100%)	15 km southwest of Wollongong, NSW	2,000
Do.	Ensham-Yongala open pit coal mine [Idemitsu Kosan Co. Ltd., 85%; J-Power (Australia) Pty. Ltd., 10%; LG International (Australia) Pty Ltd., 5%]	40 km northeast of Emerald, QLD	9,000
Do.	Ewington II open pit coal mine (Griffin Coal Mining Co. Pty. Ltd., 100%)	8 km east of Collie, WA	1,000
Do.	Foxleigh open pit coal mine (Foxleigh Mining Pty Ltd., 100%)	Bowen Basin, QLD	3,600
Do.	German Creek and German Creek East open pit/underground coal mines [Anglo American plc, 70%, and Mitsui & Co. (Australia) Ltd., 30%]	275 km west-northwest of Rockhampton, QLD	6,000

See footnotes at end of table.

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TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Coal—Continued	Glennies Creek longwall coal mine (CVRD Inco Ltd., 85%; Nippon Steel Australia Pty Ltd., 5%; POSCO Australia Pty Ltd., 5%; private, 5%)	12 km north of Singleton, NSW	2,800
Do.	Goonyella-Riverside-Broadmeadow open pit coal mines (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)	140 km southwest of Mackay, QLD	16,000
Do.	Gregory Crinum open pit/underground coal mine [BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)]	60 km north of Emerald, QLD	5,500
Do.	Hunter Valley Operations (includes Carrington Chestnut, Howick, Hunter Valley No. 1, Lemington, Riverview open pit coal mines) (Coal and Allied Industries Ltd., 100%)	10 km west and 25 km north of Singleton, NSW	15,000
Do.	Hail Creek open pit coal mine (Rio Tinto Ltd., 82%; Nippon Steel Australia Pty Ltd., 8%; Marubeni Coal Pty. Ltd., 6.66%)	100 km west of Mackay, QLD	8,000
Do.	Hazelwood open pit coal mine (International Power Hazelwood, 100%)	150 km southeast of Melbourne, VIC	20,000
Do.	Jellinbah East open pit coal mine (Queensland Coal Mine Management Pty. Ltd., 70%; Marubeni Coal Pty. Ltd., 15%; Sojitz Australia Ltd., 15%)	90 km east of Emerald, QLD	4,000
Do.	Kestrel underground coal mine [Rio Tinto Ltd., 80%, and Mitsui & Co. (Australia) Ltd., 20%]	40 km north-northeast of Emerald, QLD	5,500
Do.	Liddell open pit coal mine (Xstrata Coal Australia Pty. Ltd., 67.5%, and Mitsui Matushima Australia Pty. Ltd., 32.5%)	25 km northwest of Singleton, NSW	4,000
Do.	Loy Yang open pit coal mine (Loy Yang Power Ltd., 100%)	165 km east of Melbourne, VIC	30,000
Do.	Mondalong underground coal mine (Centennial Coal Co. Ltd., 100%)	35 km southwest of Newcastle, NSW	4,500
Do.	Moorvale open pit coal mine (Macarthur Coal Ltd., 73.3%; CITIC Resources Australia Pty Ltd., 7%; Sojtz Australia Ltd., 7%; Nippon Steel Australia Pty Ltd., 2%)	10 km south of Coppabella, QLD	3,400
Do.	Moranbah North longwall coal mine (Anglo American plc., 88%, and Nippon Steel Australia Pty. Ltd., 5%)	150 km southwest of Mackay, QLD	5,800
Do.	Mount Arthur open pit coal mine (BHP Billiton Ltd., 100%)	5 km southwest of Muswellbrook, NSW	15,000
Do.	Mount Owen open pit coal mine (Xstrata plc, 100%)	20 km northwest of Singleton, NSW	7,700
Do.	Mount Thorley open pit coal mine (Coal and Allied Industries Ltd., 80%, and POSCO Australia Pty. Ltd., 20%)	14 km southwest of Singleton, NSW	12,000
Do.	Muja open pit coal mine (The Griffin Coal Mining Co. Pty. Ltd., 100%)	18 km southeast of Collie, WA	2,000
Do.	Muswellbrook No. 2 open pit coal mine (Muswellbrook Coal Co., 100%)	4 km northeast of Muswellbrook, NSW	1,700
Do.	Myuna underground coal mine (Centennial Coal Co. Ltd., 100%)	35 km south of Newcastle, NSW	1,500
Do.	New Acland open pit coal mine (New Hope Corp. Ltd., 100%)	35 km northwest of Toowoomba, QLD	3,750
Do.	Newlands-Collinsville-Abbot Point open pit coal mine (Xstrata plc, 55%; Itochu Corp., 35%; Sumitomo Corp., 10%)	130 km west of Mackay, QLD	15,000
Do.	Newstan longwall coal mine (Centennial Coal Co. Ltd., 100%)	30 km southwest of Newcastle, NSW	4,000
Do.	North Goonyella underground coal mine (Peabody Energy Corp., 100%)	40 km north Moranbah, QLD	3,000
Do.	Norwich Park open pit coal mine (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)	85 km north-northeast of Emerald, QLD	5,000
Do.	Oaky Creek longwall and Alliance open pit coal mines (Xstrata plc, 55%; Sumitomo Coal Australia Pty. Ltd., 25%; Itocho Corp., 20%)	300 km west-northwest of Rockhampton, QLD	9,500
Do.	Peak Downs open pit coal mine (BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%)	145 km north of Emerald, QLD	9,000
Do.	Premier open pit coal mine (Wesfarmers Premier Coal Ltd., 100%)	10 km southeast of Collie, WA	4,000
Do.	Ravensworth-Narama open pit coal mine (includes Ravensworth East) (Xstrata Coal Australia Pty. Ltd., 100% of Ravensworth and 50% of Narama; Iluka Resources Ltd., 50% of Narama)	20 km northwest of Singleton, NSW	3,500
Do.	Rixs Creek open pit coal mine (Bloomfield Colliers Pty. Ltd., 100%)	5 km northwest of Singleton, NSW	2,000
Do.	Rolleston open pit coal mine (Xstrata plc, 75%; Itochu Corp., 12.5%; Sumitomo Corp., 12.5%)	90 km south-southeast of Emerald, QLD	8,000
Do.	Saraji open pit coal mine (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)	125 km north of Emerald, QLD	6,500
Do.	South Walker Creek open pit/underground coal mine (BHP Mitsui Coal Pty. Ltd., 100%)	90 km southwest of Mackay, QLD	4,300
Do.	Springvale underground coal mine (Centennial Coal Co. Ltd. 50%; SK Corp., 25%; Korea Resource Corp. Australia, 25%)	16 km northwest of Lithgow, NSW	3,000

See footnotes at end of table.

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TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Coal—Continued	Tahmoor longwall coal mine (includes Tahmoor North and Bargo) (Centennial Coal Co. Ltd., 85.79%, and private, 14.21%)	70 km southwest of Sydney, NSW	2,500
Do.	Tarong-Meandu open pit coal mine (Rio Tinto Ltd., 100%)	85 km north of Toowoomba, QLD	7,000
Do.	Ulan underground coal mine (Xstrata plc, 90%, and Mitsubishi Corp., 10%)	45 km northwest of Mudgee, NSW	5,000
Do.	United Collieries underground coal mine (Xstrata plc, 95%, and private, 5%)	15 km west of Singleton, NSW	3,000
Do.	Wambo open pit/underground coal mine (Peabody Energy Corp., 100%)	30 km from Singleton, NSW	6,000
Do.	West Cliff longwall coal mine (BHP Billiton Ltd., 100%)	43 km northwest of Wollongong, NSW	2,300
Do.	West Wallsend longwall coal mine (Xstrata plc, 70%; Marubeni Coal Pty Ltd., 17%; private, 13%)	25 km southwest of Newcastle, NSW	2,500
Do.	Yallourn open pit lignite mine (CLP Power Asia Ltd., 100%)	140 km southeast of Melbourne, VIC	18,000
Cobalt:			
Mine	Cawse open pit nickel-cobalt mine (OJSC MMC Norilsk Nickel, 100%)	50 km northwest of Kalgoorlie, WA	0.2
Do.	Murrin Murrin open pit nickel-cobalt mine (Minara Resources Ltd., 60%, and Glencore Australia Pty. Ltd., 40%)	60 km east of Leonora, WA	2.0
Do.	Radio Hill underground nickel-cobalt mine (Fox Resources Ltd., 100%)	35 km south of Karratha, WA	0.2
Do.	Ravensthorpe open pit mine (BHP Billiton Ltd., 100%)	155 km west of Esperance, WA	1.4
Refinery	Yabulu nickel-cobalt refinery (Nickel Consolidated Pty Ltd., Nickel House Pty, and Nickel Process Pty)	Townsville, QLD	3
Copper:			
Mine, Cu content	Boddington open pit/underground gold mine (Newmont Mining Corp., 100%)	130 km southeast of Perth, WA	35
Do.	Cadia Hill open pit gold-copper mine (Newcrest Mining Ltd., 100%)	21 km south-southwest of Orange, NSW	25
Do.	Cobar underground copper mine (Glencore International AG, 100%)	12 km northwest of Cobar, NSW	30
Do.	Eloise underground copper mine (FMR Investement Pty Ltd., 100%)	60 km southeast of Cloncurry, QLD	70
Do.	Ernest Henry open pit/underground copper-gold mine (Xstrata plc, 100%)	35 km northeast of Cloncurry, QLD	115
Do.	Golden Grove underground zinc-copper mine (Oxiana Ltd., 100%)	225 km east of Geraldton, WA	20
Do.	Hellyer underground zinc-lead-copper-silver mine (Bass Metals Ltd., 100%)	80 km south-southwest of Burnie, TAS	1
Do.	Lady Annie copper (solvent extraction-electrowinning) mine (CST Mining Group Ltd., 100%)	100 km north-northwest of Mount Isa, QLD	19
Do.	Leichhardt copper mine (Cape Lambert Resources Ltd., 100%)	110 km northwest of Cloncurry, QLD[3]	10
Do.	Mount Gordon open pit copper (solvent extraction-electrowinning) mine (Aditya Birla Minerals Ltd., 100%)	120 km north of Mount Isa, QLD	50
Do.	Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton Mines) (Xstrata plc, 100%)	Mount Isa, QLD	190
Do.	Mount Lyell underground copper-gold mine [Sterlite Industries (India) Ltd., 100%]	2 km northeast of Queenstown, TAS	35
Do.	Nifty open pit copper (solvent extraction-electrowinning) mine (Aditya Birla Minerals Ltd., 100%)	200 km southeast of Marble Bar, WA	25
Do.	Northparkes open pit/underground copper-gold mine (Rio Tinto Ltd., 80%; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; SC Mineral Resources Pty. Ltd., 6.7%)	30 km northwest of Parkes, NSW	90
Do.	Olympic Dam underground copper-silver-gold-uranium mine [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	235
Do.	Osborne underground copper-gold mine (Ivanhoe Australia Ltd., 100%)	120 km northeast of Boulia, QLD	22
Do.	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance) (GoldCorp Inc., 100%)	8 km south of Cobar, NSW	3
Do.	Prominent Hill open pit/underground copper-gold mine (OZ Minerals Ltd., 100%)	650 km northwest of Adelaide, SA	140
Do.	Ridgeway underground gold-copper mine (Newcrest Mining Ltd., 100%)	5 km south of Orange, NSW	30
Do.	Rosebery underground zinc-lead-silver-copper-gold mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	35 km north of Queenstown, TAS	2
Do.	Tritton underground mine (Straits Resources Ltd., 100%)	Nyngan, NSW	30
Smelter	Mount Isa copper smelter (Xstrata plc, 100%)	Mount Isa, QLD	250
Do.	Olympic Dam copper smelter [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	70
Do.	Port Kembla copper smelter (Furukawa Co. Ltd., 52.5%; Nittetsu Mining Co., 20%; Nissholwai Corp., 17.5%; Itochu Corp., 10%)	Port Kambla, NSW	120

See footnotes at end of table.

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TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Copper—Continued:				
Refinery		Olympic Dam copper refinery [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	235
Do.		Port Kembla copper refinery (Furukawa Co. Ltd., 52.5%; Nittetsu Mining Co., 20%; Nisshoiwai Corp., 17.5%; Itochu Corp., 10%)	Port Kambla, NSW	120
Do.		Townsville copper refinery (Xstrata plc, 100%)	Townsville, QLD	300
Diamond	thousand carats	Argyle Mine (AK-1 lamproite pipe and alluvial diamond mines) (Rio Tinto plc, 100%)	120 km southwest of Kununurra, WA	30,000
Do.	do.	Ellendale Mine (includes pipes 4 and 9) (Gem Diamond Ltd., 100%)	130 east southeast of Derby, WA	700
Do.	do.	Ellendale 9 North Mine (Blina Diamond NL, 100%)	140 east of Derby, WA	500
Diatomite		Barraba open pit diatomite mine (Australia Diatomite Mining Pty. Ltd., 100%)	85 km north-northwest of Tamworth, NSW	25
Dolomite		Ardrossan metallurgical dolomite quarry (OneSteel Ltd., 100%)	Northern York Peninsula, SA	650
Do.		Cookes Hill Mine (includes Nickol River and Warrawoona) (Haoma Mining NL, 100%)	Near Port Hedland, WA	400
Feldspar		Broken Hill open pit feldspar mine (includes Bakers, Lady Beryl, and Spar Ridge) (Unimin Australia Ltd.., 100%)	42 km southwest of Broken Hill, NSW	15
Garnet		Port Gregory open pit industrial garnet mine (GMA Garnet Pty. Ltd., 100%)	100 km north of Geraldton, WA	250
Gas:				
Condensate	thousand 42-gallon barrels per day	North West Shelf gas operations {Woodside Petroleum Pty. Ltd., manager [BHP Petroleum Pty. Ltd., BP Australia Holdings Ltd., Chevron Asiatic Ltd., Japan Australia LNG (MIMI) Pty. Ltd., Shell Development (Australia) Pty. Ltd., and Woodside Petroleum Ltd., 16.67% each]}	130 km offshore Dampier, WA	60
Natural	million cubic meters per day	do.	do.	20
Liquefied natural	million metric tons	do.	Four-train liquefaction plant, Burrup Peninsula, WA	12
Gold:				
Mine	kilograms	Agnew open pit/underground gold mine (Gold Fields Ltd., 100%)	23 km west of Leinster, WA	5,600
Do.	do.	Boddington open pit/underground gold mine (Newmont Mining Corp., 100%)	130 km southeast of Perth, WA	31,000
Do.	do.	Bronzewing underground gold mine (includes Mount McClure, Venus, Success, Cockburn, Corboys, Mount Joel) (Audax Resources Ltd., 100%)	65 km northeast of Leinster, WA	9,000
Do.	do.	Burnside open pit mines (includes Union Reefs, Brocks Creek, North Point, Princess Louise, Rising Tide, Zapopan, Fountain Head) (Crocodile Gold Corp., 100%)	Pine Creek, NT	6,500
Do.	do.	Cadia Hill open pit gold-copper mine (Newcrest Mining Ltd., 100%)	21 km south-southeast of Orange, NSW	11,000
Do.	do.	Ernest Henry open pit copper-gold mine (Xstrata plc, 100%)	35 km northeast of Cloncurry, QLD	3,000
Do.	do.	Granny Smith open pit gold mine (includes Wallaby) (Barrick Gold Corp., 100%)	20 km south of Laverton, WA	16,000
Do.	do.	Gwalia underground gold mine (St Barbara Ltd., 100%)	3 km south of Leonora, WA	2,600
Do.	do.	Henty underground gold-silver mine (Barrick Gold Ltd., 100%)	30 km north of Queenstown, TAS	3,700
Do.	do.	Hillgrove Mine (Straits Resources Ltd., 100%)	25 km east of Armidale, NSW	650
Do.	do.	Jundee-Nimary open pit/underground gold mine (Newmont Mining Corp., 100%)	45 km northeast of Wiluna, WA	12,000
Do.	do.	Kalgoorlie open pit/underground gold mine [Kalgoorlie Consolidated Gold Mine Pty Ltd., operator (Barrick Gold Australia, 50%, and Newmont Mining Corp., 50%)]	600 km east Perth, WA	20,000
Do.	do.	Kanowna Belle underground gold mine (Barrick Gold Corp., 100%)	18 km northeast of Kalgoorlie, WA	7,000
Do.	do.	Lawlers underground gold mine (Barrick Gold Corp., 100%)	30 km southwest of Leinster, WA	3,000
Do.	do.	Mount Lyell underground copper-gold mine [Sterlite Industries (India) Ltd., 100%]	2 km northeast of Queenstown, TAS	1,000
Do.	do.	Mount Magnet open pit/underground gold mine (includes Hill 50 and Star) (Ramelins Resources Ltd., 100%)	2 km from Mount Magnet, WA	8,500
Do.	do.	Norseman underground gold mine (Norseman Gold Plc, 100%)	Norseman, WA	3,700

See footnotes at end of table.

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TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Gold—Continued:				
Mine—Continued	kilograms	Northparkes open pit/underground copper-gold mine (Rio Tinto Ltd., 80%, and Sumitomo Metal Mining Oceania Pty. Ltd., 20%)	30 km north of Parkes, NSW	155,000
Do.	do.	Osborne underground copper-gold mine (Ivanhoe Australia Ltd., 100%)	120 km northeast of Boulia, QLD	1,000
Do.	do.	Olympic Dam underground copper-silver-gold-uranium mine [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	1,500
Do.	do.	Pajingo underground gold mine (includes Vera-Nancy) [North Queensland Metals Ltd. (operator), 60%, and Heemskirk Consolidated Ltd., 40%]	60 km south-southeast of Charters Towers, QLD	6,400
Do.	do.	Plutonic open pit/underground gold mine (Barrick Gold Corp., 100%)	180 km northeast of Meekatharra, WA	8,000
Do.	do.	Prominent Hill open pit copper-gold mine (OZ Minerals Ltd., 100%)	650 km northwest of Adelaide, SA	2,200
Do.	do.	Ravenswood open pit mine (includes Nolans, Sarsfield, and Mount Wright) (Resolute Mining Ltd., 100%)	100 km south of Townsville, QLD	3,000
Do.	do.	Ridgeway underground gold-copper mine (Newcrest Mining Ltd., 100%)	25 km south of Orange, NSW	10,800
Do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	35 km north of Queenstown, TAS	1,000
Do.	do.	Saint Ives open pit/underground gold mine (Gold Fields Ltd., 100%)	75 km south-southeast of Kalgoorlie, WA	15,000
Do.	do.	Selwyn underground copper-gold mine (Barrick Gold Corp., 100%)	160 km southeast of Mount Isa, QLD	700
Do.	do.	Stawell underground gold mine (Perseverance Corp. Ltd., 100%)	250 km west of Melbourne, VIC	3,000
Do.	do.	Sunrise Dam open pit mine gold (includes Cleo) (AngloGold Ashanti Ltd., 100%)	55 km south of Laverton, WA	15,000
Do.	do.	Super Pit open pit gold mine (includes Fimiston) [Kalgoorlie Consolidated Gold Mines Pty. Ltd., manager (Barrick Gold Corp., 50%, and Newmont Mining Corp., 50%)]	Southeast corner of the Kalgoorlie-Boulder Township, WA	25,000
Do.	do.	Tanami open pit gold mine (includes Central Desert Joint Venture) (Newmont Gold Corp., 100%)	650 km northwest of Alice Springs, NT	15,000
Do.	do.	Telfer copper and gold mine (Newcrest Mining Ltd., 100%)	400 km east southeast of Port Hedland, WA	15,000
Do.	do.	Thunderbox gold mine (Lionore Mining International Ltd., 100%)	90 km northeast of Leonora, WA	5,000
Do.	do.	Trident gold mine (Avoca Resources Ltd., 100%)	Higginsville, WA	5,000
Do.	do.	Wattle Dam gold mine (Ramelius Resources Ltd., 100%)	70 km south of Kalgoorlie, WA	3,000
Do.	do.	Wiluna open pit/underground gold mine (Apex Minerals NL, 100%)	7 km south of Wiluna, WA	3,300
Smelter	do.	Gidji Roaster gold smelter (Kalgoorlie Consolidated Gold Mines Pty. Ltd., 100%)	Kalgoorlie, WA	24,300
Refinery	do.	Perth Refinery [AGR Management Services Ltd. (Australian Gold Alliance Pty Ltd., 40%; Western Australian Mint, 40%; Johnson Matthey (Australian) Ltd., 20%]	Newburn, WA	300,000
Gypsum		Gypsum Resources Australia Pty. Ltd., 100%	Lake MacDonnell open pit gypsum mine, near Point Thevenard, SA	1,400
Do.		Dampier Salt Ltd., 100%	Lake MacLeod salt and gypsum solar	900
Iron and steel:				
Iron ore		Channar open pit iron ore mine [Hamersley Iron Pty. Ltd., 60% (Rio Tinto Ltd., 100%), and China Iron and Steel Industry & Trade Group Corp. (SINOSTEEL) (a China state-owned company), 40%]	70 km south of Tom Price, WA	11,000
Do.		Cockatoo Island open pit iron ore mine (BHP Billiton Ltd., 100%)	130 km north northeast of Derby, WA	1,500
Do.		Eastern Range open pit iron ore mine [Hamersley Iron Pty. Ltd., 54% (Rio Tinto Ltd., 100%), and Shanghai Baosteel Group Corp., 46%]	10 km east of Paraburdoo, WA	10,000
Do.		Extension Hill open pit iron ore mine (Mount Gibson Iron Ltd., 100%)	85 km of Perenjori, WA	3,000
Do.		Hamersley Operations (includes Brockman No. 2, Marandoo, Mount Tom Price, Nammuldi, Paraburdoo, and Yandicoogina open pit iron ore mines) [Hamersley Iron Pty. Ltd., 100% (Rio Tinto Ltd., 100%)]	30 km to 85 km northeast, northwest, and south of Tom Price, WA	90,000
Do.		Hope Downs Mine [Hope Downs Iron Ore Pty Ltd. (Hancock Prospecting Pty Ltd. 100%), 50%, and Rio Tinto Ltd., 50%]	75 km northwest of Newman, WA	30,000
Do.		Jimblebar open pit iron ore mine {[BHP Iron Ore (Jimblebar), 85% (BHP Billiton Ltd., 100%)]; [Mitsui Itochu Iron Pty Ltd., 10% (Mitsui & Co. (Australia) Ltd. 100%)]; [CI Minerals Australia Pty Ltd., 5% (Itochu Corp., 100%)]}	40 km east of Newman, WA	35,000
Do.		Koolan Island open pit iron ore mine (Mount Gibson Iron Ltd., 100%)	140 north of Derby, WA	4,000
Do.		Koolyanobbing Central open pit iron ore mine (Portman Ltd., 100%)	50 km north-northeast of Southern Cross, WA	6,000

See footnotes at end of table.

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TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Iron and steel—Continued:			
Iron ore—Continued	Mount Goldsworthy mining associates joint venture (includes Area C, Goldsworthy, and Nimingarra) (BHP Billiton Minerals Pty Ltd. (manager), 85%; ITOCHU Minerals & Energy of Australia Pty Ltd., 8%; Mitsui Iron Ore Corp. Pty. Ltd., 7%)	180 km east of Port Hedland, WA	42,000
Do.	Mount Gould open pit iron ore mine (Unimin Australia Ltd., 100%)	160 km west of Meekatharra, WA	6,000
Do.	Mount Newman open pit iron ore mine (includes Mount Whaleback, Orebody 23–25, Orebody 29, and Orebody 30–35) [BHP Billiton Minerals Pty Ltd., 85% (BHP Billiton Ltd., 100%); Mitsui Itochu Iron Pty Ltd., 10% (Mitsui & Co. (Australia) Ltd., 100%); CI Minerals Australia Pty Ltd., 5% (Itochu Corp., 100%)]	Within 13 km of Newman, WA	30,000
Do.	Pannawonica (includes Mesa A and J) open pit iron ore mine [Robe River Iron Associates, manager (Rio Tinto Ltd., 53%; Mitsui & Co. (Australia) Ltd., 33%; Nippon Steel Australia Pty. Ltd., 10.5%; Sumitomo Metal Australia Pty. Ltd., 3.5%]	130 km south-southwest of Dampier, WA	32,000
Do.	Cloudbreak iron ore mine (includes Chicester Range, Christmas Creek, WhiteKnight, Mount Lewin, Mount Nicholas, and Flinders) (Fortescue Metals Group Ltd., 100%)	Chichester Ranges, East Pilbara, WA	55,000
Do.	Savage River open pit iron ore mine (Stemcor Holdings Ltd., 100%)	100 km southwest of Burnie, TAS	2,400
Do.	Tallering Peak open pit iron ore mine (Mount Gibson Iron Ltd., 100%)	120 northeast of Geraldton, WA	3,000
Do.	Whyalla open pit iron ore mines (OneSteel Ltd., 100%)	270 km northwest of Adelaide, SA	2,600
Do.	Yandi open pit iron ore mine (BHP Billiton Minerals Pty Ltd., 85%, manager; ITOCHU Minerals & Energy of Australia Pty Ltd., 8%; Mitsui Iron Ore Corp. Pty. Ltd., 7%)	92 km north of Newman, WA	42,000
Pig iron	Hismelt pig iron plant [Hismelt Corp. Pty Ltd. (Rio Tinto Ltd., 60%; Nucor Corp., 25%; Mitsubishi Corp., 10%; and Shougang Corp., 5%]	Kwinana, WA	800
Steel	OneSteel Whyalla steelworks (OneSteel Ltd., 100%)	Whyalla, SA	1,200
Do.	Port Kembla steelworks (Blue Scope Steel Ltd., 100%)	Port Kembla, NSW	2,500
Do.	Smorgon Steel Group Ltd.	Laverton, Melbourne, VIC	700
Do.	do.	Waratch, NSW	285
Kaolin	Axedale Clays open pit kaolin mine (E Clay Pty Ltd., 100%)	18 km east of Bendigo, VIC	50
Do.	Pittong open pit kaolin mine (Imerys Minerals Australia Pty Ltd., 100%)	35 km southwest of Ballarat, VIC	110
Do.	Skardon River open pit kaolin mine (Queensland Kaolin Pty. Ltd., 96.6%, and private, 3.4%)	85 km north of Weipa, QLD	150
Lead:			
Mine, lead content	Anges zinc mine (Terramin Australia Ltd., 100%)	2 km from Strathalbyn, SA	10
Do.	Broken Hill underground silver-zinc-lead mine (Shenzhen Zhongjin Lingnan Nonfemet Co. Ltd., 50.1%, and Perilya Ltd., 49.9%)	Broken Hill, NSW	90
Do.	Cannington underground silver-lead-zinc mine (BHP Billiton Ltd., 100%)	85 km southwest of McKinlay, QLD	265
Do.	Century open pit zinc-silver-lead mine (Zinifex Ltd., 100%)	250 km north of Mount Isa, QLD	90
Do.	Endeavor underground zinc-silver-lead mine (CBH Resources Ltd., 100%)	40 km northwest of Cobar, NSW	45
Do.	Hellyer underground zinc-lead-copper-silver mine (Baee Metals Ltd., 100%)	80 km south-southwest of Burnie, TAS	44
Do.	Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton Mines) (Xstrata plc, 100%)	Mount Isa, QLD	150
Do.	Rosebery underground zinc-lead-silver-copper-gold mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	5 km north of Queenstown, TAS	25
Smelter	Mount Isa smelter (Xstrata plc, 100%)	Mount Isa, QLD	240
Do.	Port Pirie smelter (Nyrstar Corp., 100%)	5 km north of Queenstown, TAS	235
Magnesite	Kunwarara open pit magnesite mine (includes Marlborough) [Queensland Magnesia Pty Ltd. (operator), Sibelco Group, 100%]	70 km northwest of Rockhampton, QLD	3,000
Do.	Thuddungra Mine (Orind Australia Pty Ltd., 100%)	38 km northwest of Young, NSW	80

See footnotes at end of table.

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TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Manganese:			
Mine, concentrate	Bootu Creek open pit manganese mine (OM Holding Ltd., 100%)	110 km north of Tennant Creek, NT	600
Do.	Groote Eylandt open pit manganese mine [Groote Eylandt Mining Co., operator (BHP Billiton Ltd., 60%, and Anglo American Corp., 40%)]	Groote Eylandt, NT	3,100
Do.	Woodie Woodie open pit manganese mine (includes Bells and East Pilbara leases) [Pilbara Manganese Pty Ltd., operator (Consolidated Minerals Ltd., 100%)]	400 southeast of Port Hedland, WA	1,000
Alloys	Bell Bay Smelter [Tasmanian Electro Metallurgical Co. Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Bell Bay, TAS	250
Mineral sands	Eneabba open pit heavy-mineral sands mine (Iluka Resources Ltd., 100%)	260 km north of Perth, WA	NA
Do.	Hawks Nest heavy-mineral sands dredge (Mineral Deposits Ltd., 100%)	50 km northeast of Newcastle, NSW	NA
Do.	Jangardup heavy-mineral sands dredge (Cable Sands (WA) Pty. Ltd., 100%)	50 km south of Nannup, WA	NA
Do.	North Capel open pit heavy-mineral sands mine (Iluka Resources Ltd., 100%)	7 km north of Capel, WA	NA
Do.	North Stradbroke Island heavy-mineral sands dredge (Stradbroke Rutile Pty. Ltd., 100%)	35 km east of Brisbane, QLD	NA
Do.	Tiwest Joint Venture heavy-mineral sands dredge (KMCC Western Australia Pty. Ltd., 50%, and Ticor Resources Pty. Ltd., 50%)	180 km north of Perth, WA	NA
Do.	Wemen heavy-mineral sands dredge (Murray Basin Titanium Pty. Ltd., 100%)	80 km southeast of Mildura, VIC	NA
Molybdenum metric tons	Wolfram Camp molybdenum-tungsten mine (Queensland Ore Ltd., 85%, and private, 15%)	85 km west of Cairns, QLD	120
Nickel:			
Mine, Ni content	Avebury nickel mine (includes Bison, North Avebury, Saxon, and West Viking) [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	Near Zeehan, TAS	7
Do.	Black Swan underground nickel mine (includes Silver Swan) (OJSC MMC Norilsk Nickel, 100%)	53 km northeast of Kalgoorlie, WA	10
Do.	Carnilya Hill open pit mine (Mincor Resources NL, 70%, and View Resources Ltd., 30%)	25 km northeast of Kambalda, WA	5
Do.	Cawse open pit nickel-cobalt mine (OJSC MMC Norilsk Nickel, 100%)	50 km northeast of Kalgoorlie, WA	9
Do.	Cosmos open pit nickel mine (Xstrata plc, 100%)	50 km north of Leinster, WA	13
Do.	Flying Fox underground mine (Western Areas NL, 100%)	108 km south of Marvel Loch, WA	15
Do.	Kambalda underground nickel mines (Palmary Enterprises Ltd., 100%)	5 km south of Kambalda, WA	35
Do.	Lake Johnson underground nickel mine (includes Maggie Hays, Maggie Hays Lake, and Emily Ann) (OJSC MMC Norilsk Nickel, 100%)	130 km west of Norseman, WA	12
Do.	Lanfranchi underground mine (includes Deacon, Schmitz, Tramway, and Winner) (Panoramic Resources Ltd., 100%)	42 km south of Kambalda, WA	10
Do.	Leinster open pit/underground nickel mines (BHP Billiton Ltd., 100%)	10 km north of Leinster, WA	44
Do.	Long underground mine (Independence Group NL, 100%)	Near Kambalda East, WA	10
Do.	Miitel underground nickel mine (includes Redross and Mariners) (Mincor Resources NL, 100%)	70 km south of Kambalda, WA	10
Do.	Mount Keith open pit nickel mine (includes Cliffs and Yakabindie) (BHP Billiton Ltd., 100%)	70 km south-southeast of Wiluna, WA	40
Do.	Murrin Murrin open pit nickel-cobalt mine (Minara Resources Ltd., 60%, and Glencore International AG, 40%)	60 km east of Leonora, WA	34
Do.	Radio Hill underground nickel-cobalt mine (Fox Resources Ltd., 100%)	35 km south of Karratha, WA	4
Do.	Ravensthorpe open pit mine (First Quantum Minerals Ltd., 100%)	155 km west of Esperance, WA[3]	39
Do.	Savannah underground mine (Panoramic Resources Ltd., 100%)	120 km north of Halls Creek, WA	8
Do.	Spotted Quoll nickel mine (includes Tim King and Willy Willy) (Western Areas NL, 100%)	114 km south of Marvel Loch, WA	10
Do.	Waterloo underground nickel mine (includes Amorac) (OJSC MMC Norilsk Nickel, 100%)	90 km north of Leonora, WA	5

See footnotes at end of table.

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TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1,2]	Annual capacity[e]
Nickel—Continued:				
Smelter		Kalgoorlie nickel smelter (BHP Billiton Ltd., 100%)	Kalgoorlie, WA	100
Refinery		Kwinana nickel refinery (BHP Billiton Ltd., 100%)	Kwinana, WA	67
Do.		Murrin Murrin nickel refinery (Minara Resources Ltd., 60%, and Glencore International AG, 40%)	Murrin Murrin, WA	45
Do.		Yabulu nickel-cobalt refinery (Nickel Consolidated Pty Ltd., Nickel House Pty Ltd., and Nickel Process Pty Ltd.)	Townsville, QLD	40
Opal		Many small producers	Andamooka and Coober Pedy areas, SA; Lightning Ridge area, NSW	NA
Petroleum	thousand 42-gallon barrels per day	Exxon Mobil Corp., 100%	Altona Refinery, VIC	120
Do.	do.	Bulwer Island Refinery [BP Amoco Refinery (Bulwer Island) Pty. Ltd., 100%]	Bulwer Island, QLD	69.3
Do.	do.	Clyde Refinery [Shell Refining (Australia) Pty. Ltd., 100%]	Clyde, NSW	85
Do.	do.	Geelong Refinery [Shell Refining (Australia) Pty. Ltd., 100%]	Geelong, VIC	110
Do.	do.	Kurnell Refinery (Caltex Australia Ltd., 100%)	Kurnell, NSW	114
Do.	do.	Kwinana Refinery [BP Amoco Refinery (Kwinana) Pty. Ltd., 100%]	Kwinana, WA	138
Do.	do.	Lytton Refinery (Caltex Australia Ltd., 100%)	Lytton, QLD	106
Do.	do.	Port Stanvac Refinery (Exxon Mobil Corp., 100%)	Port Stanvac, SA	69
Phosphate rock		Phosphate Hill-Duchess open pit phosphate mine (Incitec Pivot Ltd., 100%)	140 km northwest of Mount Isa, QLD	2,200
Rare earth, rare-earth oxide		Mount Weld Mine (Lynas Corp. Ltd.)	Mount Weld, WA	1,100
Salt		Dampier solar evaporation salt pans (Dampier Salt Ltd., 100%)	Near Dampier, WA	4,000
Do.		Lake MacLeod solar salt and gypsum evaporation pans (Dampier Salt Ltd., 100%)	65 km north of Carnarvon, WA	900
Do.		Port Hedland solar salt fields (Dampier Salt Ltd., 100%)	Port Hedland, WA	3,000
Silica		Itochu Corp., 50%, and Tochu Corp., 50%	Kemerton silica sands dredge, 25 km northeast of Bunbury, WA	450
Silver:				
Mine, Ag content	kilograms	Broken Hill underground silver-zinc-lead mine (Shenzhen Zhongjin Lingnan Nonfemet Co. Ltd., 50.1%, and Perilya Ltd., 49.9%)	Broken Hill, NSW	81,200
Do.	do.	Cannington underground silver-lead-zinc mine (BHP Billiton Ltd., 100%)	85 km southwest of McKinlay, QLD	700,000
Do.	do.	Century open pit zinc-silver-lead mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	250 km north of Mount Isa, QLD	3,000
Do.	do.	Pasminco Ltd., 100%	Cockle Creek silver smelter, NSW	85,000
Do.	do.	Endeavor underground zinc-silver-lead mine (CBH Resources Ltd., 100%)	40 km northwest of Cobar, NSW	35,000
Do.	do.	Hellyer underground zinc-lead-copper-silver mine (Intec Ltd., 50%, and Polymetals Mining Services Pty Ltd., 50%)	80 km south-southwest of Burnie, TAS	60,000
Do.	do.	Henty underground gold-silver mine (Barrick Gold Ltd., 100%)	30 km north of Queenstown, TAS	1,100
Do.	do.	Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton Mines) (Xstrata plc, 100%)	Mount Isa, QLD	375,000
Do.	do.	Olympic Dam underground copper-silver-gold-uranium mine [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	27,000
Do.	do.	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), (GoldCorp Inc., 100%)	8 km south of Cobar, NSW	6,000
Do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	5 km north of Queenstown, TAS	35,000
Smelter	do.	Port Pirie smelter (Nyrstar Corp., 100%)	do.	450,000
Refinery	do.	Perth Refinery [AGR Management Services Ltd. (Australian Gold Alliance Pty Ltd., 40%; Western Australian Mint, 40%; and Johnson Matthey (Australian) Ltd., 20%]	Newburn, WA	81,000

See footnotes at end of table.

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TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Spodumene		Greenbushes open pit/underground tantalite-spodumene mine (Talison Lithium Ltd., 100%)	70 km southeast of Bunbury, WA	260
Do.		Mount Cattlin spodumene mine (Galaxy Resources Ltd., 100%)	2 km north of Ravensthorpe, WA	140
Talc		Three Springs open pit talc mine (Imerys SA, 100%)	330 km north of Perth, WA	150
Tantalum, tantalite, Ta_2O_5 content	metric tons	Greenbushes open pit/underground tantalite-spodumene mine (Global Advanced Metals Ltd., 100%)	70 km southeast of Bunbury, WA	550
Do.	do.	Bald Hill tantalite mine (Haddington Resources Ltd., 100%)	60 km southeast of Kambalda, WA[3]	100
Do.	do.	Wodgina open pit tantalite mine (Global Advanced Metals Ltd., 100%)	70 km southeast of Bunbury, WA[3]	250
Tin:				
Mine, Sn content	do.	Collingwood underground tin mine (Metals X Ltd., 100%)	35 km south of Cooktown, QLD[3]	3,000
Do.	do.	Greenbushes open pit/underground tantalite-spodumene mine (Global Advanced Metals Ltd., 100%)	70 km southeast of Bunbury, WA[3]	1,000
Do.	do.	Mount Bischoff open pit mine (Metals X Ltd., 50% and Yunnan Tin Group of China, 50%)	55 km southwest of Burnie, TSA[3]	6,000
Do.	do.	Renison Bell underground tin mine (Metals X Ltd., 50% and Yunnan Tin Group of China, 50%)	136 km south of Burnie, TAS	4,000
Smelter	do.	Greenbushes smelter (Global Advanced Metals Ltd., 100%)	70 km southeast of Bunbury, WA[3]	1,000
Tungsten, W content	do.	Kara magnetite and scheelite mine (Itochu Corp., 50%, and Tasmania Mines Ltd., 50%)	30 km south of Burnie, TAS	50
Do.	do.	Wolfram Camp molybdenum-tungsten mine (Queensland Ore Ltd., 85%, and private, 15%)	85 km west of Cairns, QLD	500
Uranium, U_3O_8 content	do.	Beverley in situ leach uranium operation (Heathgate Resources Pty. Ltd., 100%)	300 km northeast of Port Augusta, SA	1,000
Do.	do.	Olympic Dam underground copper-silver-gold-uranium mine [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	4,400
Do.	do.	Ranger open pit uranium mine (Energy Resources of Australia Ltd., 100%)	230 km east of Darwin, NT	5,000
Vanadium, V_2O_5 content	do.	Windimurra open pit mine vanadium (Precious Metals Australia Ltd., 90%, and Noble Group Ltd., 10%)	100 km east-southeast of Mount Magnet, WA[3]	8
Zinc:				
Mine, Zn content		Anges zinc mine (Terramin Australia Ltd., 100%)	2 km from Strathalbyn, SA	24
Do.		Broken Hill underground silver-zinc-lead mine (Shenzhen Zhongjin Lingnan Nonfemet Co. Ltd., 50.1%, and Perilya Ltd., 49.9%)	Broken Hill, NSW	360
Do.		Cannington underground silver-lead-zinc mine (BHP Billiton Ltd., 100%)	85 km southwest of McKinlay, QLD	100
Do.		Century open pit zinc-silver-lead mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	250 km north of Mount Isa, QLD	500
Do.		Endeavor underground zinc-silver-lead mine (CBH Resources Ltd., a subsidiary of Toho Zinc Co. Ltd. of Japan, 100%)	40 km northwest of Cobar, NSW	125
Do.		Golden Grove underground zinc-copper mine (OZ Minerals Ltd., 100%)	225 km east of Geraldton, WA	150
Do.		Hellyer underground zinc-lead-copper-silver mine (Intec Ltd., 50%, and Polymetals Mining Services Pty Ltd., 50%)	80 km south-southwest of Burnie, TAS[3]	130
Do.		Jaguar underground mine (Jabiru Metals Ltd., 100%)	250 km north of Kalgoorlie, WA	420
Do.		McArthur River open pit mine [McArthur River Mining Pty Ltd., operator (Xstrata plc, 100%)]	60 km southwest of Borroloola, NT	143
Do.		Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton Mines) (Xstrata plc, 100%)	Mount Isa, QLD	175
Do.		Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), (GoldCorp Inc., 100%)	8 km south of Cobar, NSW	8
Do.		Rosebery underground zinc-lead-silver-copper-gold mine [Minerals and Metals Group Australia Ltd., operator (China Minmetals Nonferrous Metals Co. Ltd., 100%)]	35 km north of Queenstown, TAS	100

See footnotes at end of table.

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TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Zinc:			
Smelter	Port Pirie smelter (Nyrstar Corp., 100%)	5 km north of Queenstown, TAS	45
Do.	Hobart smelter (OZ Minerals Ltd., 100%)	Hobart, TAS	320
Refinery	Sun Metals zinc refinery [Sun Metals Corp. Pty. Ltd., operator (Korea Zinc Co., 100%)]	Townsville, QLD	170

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

[1]Abbreviations for States and Territories in this table include the following: NSW—New South Wales; NT—Northern Territory; QLD—Queensland; SA—South Australia; TAS—Tasmania; VIC—Victoria; WA—Western Australia.

[2]Abbreviation(s) used for unit(s) of measure in this table include the following: km—kilometer.

[3]On care-and-maintenance status; expansion project development decision pending.

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TABLE 3
AUSTRALIA: RESERVES OF MAJOR MINERAL COMMODITIES IN 2011

Commodity		Reserves[1]
Antinomy, Sb content	thousand metric tons	95
Bauxite	million metric tons	6,000
Coal:		
Black:		
In situ	billion metric tons	56
Recoverable	do.	41
Brown:		
In situ	do.	44
Recoverable	do.	39
Cobalt, Co content	thousand metric tons	1,200
Copper, Cu content	million metric tons	86
Diamond:		
Gem and near gem	million carats	143
Industrial	do.	149
Gold, Au content	metric tons	8,400
Iron ore	billion metric tons	35
Lead, Pb content	million metric tons	35
Lithium, Li content	thousand metric tons	483
Magnesite ($MgCO_3$ content)	million metric tons	330
Manganese ore	do.	178
Mineral sands:		
Ilmenite	do.	200
Rutile	do.	23
Zircon	do.	39
Molybdenum, Mo content	thousand metric tons	324
Nickel, Ni content	million metric tons	21
Niobium (columbium) and tantalum:		
Niobium (columbium), Nb content	thousand metric tons	134
Tantalum, Ta content	do.	53
Platinum-group metals (Pd, Pt)	metric tons	4
Rare earths (REO plus Y_2O_3)	thousand metric tons	1,830
Silver, Ag content	do.	77
Tin, Sn content	do.	358
Tungsten, W content	do.	403
Uranium, U content	do.	1,160
Vanadium, V content	do.	1,760
Zinc, Zn content	million metric tons	65

do. Ditto.
[1]Economic demonstrated resources. Data have been rounded to no more than three significant digits.

Source: Geoscience Australia, 2010, Australia's identified mineral resources 2011: Canberra, Australian Capital Territory, Australia, Geoscience Australia, p. 5.

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THE MINERAL INDUSTRY OF BANGLADESH

By Yadira Soto-Viruet and Yolanda Fong-Sam

Bangladesh's mineral industry was dominated by the productin of cement, natural gas, petroleum, and salt. Other mineral commodities produced in the country included coal, granite, kaolin, limestone, and nitrogen. The country lacks reserves of metallic minerals but has large potential for the occurrence of natural gas. In 2010 (the most recent year for which data were available), mining accounted for 1.1% of the country's gross domestic product (GDP), and the construction sector accounted for 7.4% (Asian Development Bank, 2011, p. 1).

The Bangladesh Oil, Gas and Mineral Corp. (Petrobangla) is the Government entity that is responsible for the exploration for, production of, and transmission and distribution of natural gas in Bangladesh. Petrobangla was also in charge of the development of the country's mineral deposits that had been determined to be economically feasible, whereas exploring for minerals was the responsibility of the Geological Survey of Bangladesh (Bangladesh Oil, Gas and Mineral Corp., 2010, p. 8, 15).

In 2011, the draft of the National Coal Policy was under revision. The policy would provide guidance for the development of the coal industry and seek to establish coal as a primary fuel for power generation to ensure a reliable source of energy for the country. To promote the exploration, development, mining, and marketing of coal, the new policy proposed a waiver of corporate taxes for contractors and licensees. Other incentives included a rebate for duties and taxes applied to the import of machinery to be used for coal mining. The policy recommends competitive bidding in order for the Government to grant permits and licenses to contractors and encourages private and public joint-venture investments as well as foreign direct investment (EnergyBangla.com, 2010).

During 2010, Bangladesh, Burma, and India were involved in maritime boundary disputes regarding their respective sovereignty in the Bay of Bengal. For many years, these countries had attempted to negotiate and delimit their claims in the disputed area. On December 2009, Bangladesh and Burma accepted the jurisdiction of the International Tribunal for the Law of the Sea (ITLOS) in Germany for the settlement of the dispute concerning their maritime boundary delimitation. At the time, although accepting ITLOS jurisdiction, the countries had not agreed on a bilateral solution regarding the delimitation principle to be used, and negotiations continued between the countries. ITLOS is an independent judicial body established by the United Nations Convention on the Law of the Sea (UNCLOS) that has jurisdiction to arbitrate disputes arising out of the interpretation and application of the Law of the Sea. UNCLOS establishes a legal framework to regulate ocean space and its resources and uses. In meetings held in January 2010, Bangladesh and Burma agreed to delimit the area by combining the equidistance and equity demarcation principles. In October 2010, Burma and India reached an informal understanding to cooperate with each other on the settlement of their maritime dispute with Bangladesh (Durham University, 2010; International Tribunal for the Law of the Sea, 2010; Priyo.com, 2010).

For several weeks in September 2011, representatives from Bangladesh and Burma met with the ITLOS for a final round of pleadings regarding the delimitation of the maritime boundary dispute between the two countries. ITLOS determined that a final judgment would be delivered by March 14, 2012. Bangladesh's border-dispute points with neighboring Burma were along the Rakhine State boundary. Although the two countries had been involved in maritime border disputes for the past few years, the bilateral trading between them was estimated to have been about $140 million per year (Xinhuanet.com, 2011).

Production

Data on mineral production in table 1 have been estimated for 2011.

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

Commodity Review

Industrial Minerals

Cement.—Lafarge Surma Cement Ltd., which was a joint venture of Cementos Molins S.A. of Spain and Lafarge Group of France, operated a plant located at Chhatak in the district of Sunamganj in northeastern Bangladesh. The Lafarge Surma Cement plant was the only integrated clinker and cement producer in Bangladesh. The company mined the raw material that fed the plant from its affiliate quarry at East Khasi Hills in Meghalaya State, India. Materials from the quarry were transported 17 kilometers (km) across the border from India to Bangladesh. In 2010, the Supreme Court of India suspended the mining operations in the quarry because the area had been catalogued by the Indian Government as eco-sensitive forest land with indigenous ownership. In August, the Supreme Court of India allowed Lafarge Surma to resume its mining operations in the quarry. During the year, the company produced about 885,000 metric tons (t) of cement and 485,000 t of clinker. The plant had the capacity to produce about 1.5 million metric tons per year (Mt/yr) of cement (Lafarge S.A., 2012, p. F66; Lafarge Surma Cement Ltd., 2012, p. 29).

HeidelbergCement Group of Germany through its subsidiary HeidelbergCement Bangladesh Ltd. operated two cement plants in the country. The plants were located in the Patenga area of Chittagong and the Kanchpur area of Narayanganj. During the year, the company completed the construction of an additional cement mill in the Chittagong grinding plant at a cost of about $16 million. The new mill was expected to be in operation by January 2012 and would have a production capacity of 0.8 Mt/yr (HeidelbergCement Group, 2012a, p. 110; 2012b).

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M.I. Cement Factory Ltd., which was located in the District of Munshiganj, produced a total of 719,800 t of cement in 2011 compared with about 571,400 t in 2010. During the year, the company completed an expansion project at its cement plant (4th unit), which would add a production capacity of about 3,000 metric tons per day. The 4th unit began commercial production in November. The company expected to produce about 1 Mt/yr of cement. The company planned to sell 80% of its production to the local market and to export 20% to India (Cemnet.com, 2011; M.I. Cement Factory Ltd., 2011, p. 40; 2012, p. 5).

Premier Cement Mills Ltd. of Bangladesh completed an expansion project at its Unit-2 cement plant, which began operation in January. The Unit-2 plant, which was located in the District of Munshiganj, would add a production capacity of about 0.6 Mt/yr. The company expected to increase its production capacity to 2.4 Mt/yr from 1.2 Mt/yr by late 2012 (Premier Cement Mills Ltd., 2013).

In addition, at least three companies were engaged in cement expansion projects in Bangladesh. These companies included national companies Meghna Cement Mills Ltd., Shah Cement Industries Ltd., and Holcim Bangladesh Ltd. of Switzerland.

Stone, Crushed.—Maddhapara Granite, which was a subsidiary of Petrobangla, was responsible for the production of granite at Petrobangla's underground mine in the District of Dinajpur. The facility had the capacity to produce about 1.65 Mt/yr of hard rock. During fiscal year 2010 (the most recent fiscal year for which data were available), which ran from July 2009 through June 2010, the Maddhapara Mine produced a total of 290,187 t of granite (Bangladesh Oil, Gas and Mineral Corp., 2010, p. 27).

Mineral Fuels

Coal.—In June, the Government lifted the ban on the importation of coal that has sulfur content greater than 1%, which was implemented in 2009. The Government decided to extend the importation of coal from India for a period of 1 year. The coal was transported across the Sylhet portion of the Bangladesh border from Meghalaya State in neighboring India (Telegraph, The, 2011).

The Barapukuria coal mine, which was owned by Barapukuria Coal Mining Co. Ltd. (a subsidiary of Petrobangla), was the first and only operating coal mine in Bangladesh. In 2005, the company signed a management, production, and maintenance contract with China National Machinery Import and Export Corp. (CMC) and Xuzhou Coal Mining Group Co. Ltd. (XMC) of China; this contract expired in August 2010. In December 2010, the Government opened a bid round for a new contract. In October 2011, the Government awarded the new management, production and maintenance contract to CMC and XMC for the next 6 years. The Barapukuria Mine is located in the District of Dinajpur and had the capacity to produce about 1 Mt/yr of coal (Bangladesh Oil, Gas and Mineral Corp., 2010; Rahman, 2011).

Natural Gas.— ConocoPhillips Co. of the United States signed a production-sharing contract (PSC) with the Government and Petrobangla for the exploration of two offshore blocks in the Bay of Bengal. The blocks, Blocks DS–08–10 and DS–08–11, are located about 280 km from Chittagong and cover a total area of about 5,158 square kilometers (km^2) in water ranging in depth from 1,000 to 1,500 meters. The PSC contract was for 9 years, during which the company would conduct exploration, including 5 years of primary exploration followed by 2 years each for two extended exploration periods. During the primary exploration period the company would conduct a 973-line-km seismic survey and drill one optional exploration well. The extended exploration program would include a 500-km^2 three-dimensional survey and one exploration well. In December, Petrobangla approved a proposal submitted by ConocoPhillips to conduct a two-dimensional seismic survey that was expected to begin in February 2012 (ConocoPhillips Co., 2011, Energy-pedia News, 2011).

Petroleum.—Eastern Refinery Ltd. (a subsidiary of Bangladesh Petroleum Corp.) was Bangladesh's sole petroleum refining company. The Eastern refinery, which was located in Chittagong, produced petroleum products from imported crude oil. The company continued with its plans for what the company termed the BMRE (balancing, modernization, rehabilitation, and expansion) of the Eastern refinery at a cost of about $1 billion. In 2010, bids were open for the funding of this expansion project. The Government received applications for the BMRE in mid-2011 and selected Foster Wheeler AG of Switzerland to lead the project; however, no further details as to when the expansion might take place were available. The proposed expansion project would increase the refinery's production capacity to 4.5 Mt/yr from 1.5 Mt/yr (Bangladesh Economic News, 2011; Independent Publications Ltd., 2011).

Outlook

The Government has made investment in the country's power generation platform a priority. The building of new powerplants and gas transmission pipelines, the implementation of other infrastructure improvements, such as bridges, and other development projects taking place in Bangladesh are expected to continue to increase demand for building materials, such as cement and crushed stone, in the near future. The fast-growing infrastructure development and the increase of materials demand will most likely influence trade with neighboring countries and positively contribute to the economy of the region.

The success of the country in overcoming its energy supply shortage will be subject to the commencement of projects in the coal and gas sectors that started during the past 3 years and the granting of permits for projects proposed recently. In addition, the country is expected to be less dependent on imported industrial materials, such as cement, as projects in the development stages reach the production stage.

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TABLE 1
BANGLADESH: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
Cement, hydraulic[4]		5,100,000	5,000,000	5,000,000	5,000,000	5,000,000
Clays, kaolin[4]		8,600	8,500	8,500	8,500	8,500
Coal, bituminous[4]		678,000 [5]	857,648 [r,5]	730,866 [r,5]	666,635 [r,5]	700,000
Gas, natural, marketed[4,6]	million cubic meters	17,014 [5]	18,511 [r,5]	19,919 [r,5]	20,075 [r,5]	20,100
Iron and steel, metal, steel products[4]		60,000	60,000	60,000	60,000	60,000
Nitrogen, N content of urea, ammonia, ammonium sulfate		1,300,000	1,300,000	1,300,000	1,300,000	1,300,000
Petroleum:						
Crude	thousand 42-gallon barrels	1,800	1,800	1,800	1,800	1,800
Refinery products	do.	9,400	9,500	9,500	9,500	9,500
Salt, marine[4]		360,000	1,368,323 [r,5]	1,388,557 [r,5]	1,409,239 [r,5]	1,410,000
Stone, crushed:						
Granite		258,516 [5]	267,434 [5]	290,187 [r,5]	300,000 [r]	300,000
Limestone		70,000	70,000	70,000	70,000	70,000

[r]Revised. do. Ditto.
[1]Estimated data are rounded to no more than three significant digits.
[2]Table includes data available through January 10, 2013.
[3]In addition to the commodities listed, crude construction materials, such as sand and gravel and other varieties of stone, presumably are produced, but available information is inadequate to make reliable estimates of output.
[4]Data are for fiscal year ending June 30 of following year.
[5]Reported figure.
[6]Gross production is not reported; the quantity vented, flared, or reinjected is believed to be negligible.

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TABLE 2
BANGLADESH: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Cement		Bangladesh Oil, Gas and Mineral Corp. (Petrobangla)	Chittagong	1,000.
Do.		do.	Sylhet	1,100.
Do.		Cemex Cement Bangladesh Ltd.	Mahmudnagar	600.
Do.		HeidelbergCement Bangladesh Ltd.	Chittagong and Narayangonj (near the capital Dhaka)	2,000.
Do.		Holcim (Bangladesh) Ltd.	Bagerhat and Narayanganj	1,300.
Do.		Lafarge Surma Cement Ltd. (Lafarge Group and Cementos Molins S.A.)	Chhatak, Sunamganj	1,500 (1,150 clinker).
Do.		Meghna Cement Mills Ltd. (an enterprise of the Bashundhara Group of Bangladesh)	Mongla Port Industrial Zone and Pashur River Bank facility	1,000.
Do.		Premier Cement Mills Ltd.	Muktarpul and Munshiganj	1,460.
Do.		Shah Cement Industries Ltd.	Dhaka	1,860.
Do.		Unique Cement Industries Ltd.	Chittagong, Dhaka, and Sylhet	1,440.
Do.		Various	18 additional facilities	5,240.
Coal		Barapukuria Coal Mining Co. Ltd. (BCMCL) [Bangladesh Oil, Gas and Mineral Corp. (Petrobangla), 100%]	Barapukuria	1,000.
Fertilizer		Bangladesh Chemical Fertilizer Corp.	Auganish	560.
Do.		do.	Fenchugani	100.
Do.		do.	Ghorasai	600.
Gas, natural	million cubic meters per day	Bangladesh Gas Fields Co. Ltd. (BGFCL) [Bangladesh Oil, Gas, and Mineral Corp. (Petrobangla), 100%]	Bakhrabad, Habigangj, Kamta, Meghna, Narsingdi, and Titas	22.
Do.	do.	Bangladesh Petroleum Exploration and Production Co. Ltd. (BAPEX) [Bangladesh Oil, Gas and Mineral Corp. (Petrobangla), 100%]	Fenchuganj and Saldanadi	2.
Do.	do.	Santos International Holdings Pty. Ltd.	Sangu (offshore)	3.
Do.	do.	Chevron Corp.	Bibiyana	19.8.
Do.	do.	do.	Jalalabad	3.9.
Do.	do.	do.	Maulavi Bazar	1.6.
Do.	do.	Niko Resources Ltd.	Bibiyana and Feni	6.
Do.	do.	Sylhet Gas Fields Ltd. (SGFL) [Bangladesh Oil, Gas and Mineral Corp. (Petrobangla), 100%]	Beanibazar, Haripur, Kailashtila, and Rashidpur	5.
Do.	do.	Tullow Oil plc, 30%	Bangora field	3.4.
Petroleum:				
Crude	42-gallon barrels per day	Santos International Holdings Pty. Ltd.	Sangu	30,000.
Refined	do.	Eastern Refinery Ltd.	Chittagong	34,000.
Steel, crude		Bangladesh Steel and Engineering Corp.	do.	20.
Stone, crushed, granite		Maddhapara Granite Mining Co. Ltd. [Bangladesh Oil, Gas and Mineral Corp. (Petrobangla)]	Maddhapara, District of Dinajpur	1,650 (hard rock).

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.

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The Mineral Industries of Bhutan and Nepal

By Lin Shi

BHUTAN

Bhutan had monetary and trade links mainly with India, and its economy was significantly influenced by that of India. Bhutan's economy continued to grow steadily in 2011. The growth rate of the gross domestic product (GDP) in real terms was about 8%, the GDP based on purchasing power parity was about $4 billion, and the average inflation rate was about 7%. In addition to receiving financial assistance from India, Bhutan generated income by selling hydroelectric power to India.

The mineral industry of Bhutan was small and not a significant contributor to the country's economy. The country produced and exported cement, copper wire, ferrosilicon, and manganese. Other mineral production included coal, dolomite, and limestone (table 1; U.S. Central Intelligence Agency, 2012). On April 13, the Royal Government of Bhutan published a draft Mineral Development Policy 2011, which addressed the mineral conservation and value addition policies in Bhutan (Royal Government of Bhutan, 2011).

Dungsam Cement Construction Ltd. (DCCL) of India was constructing a cement plant at Nganglam in Pemagatshel District, which is located in southeastern Bhutan. The plant was to have a design capacity of 1.3 million metric tons per year (Mt/yr) of cement. DCCL planned to sell 90% of the plant's cement production to India and to supply the remaining 10% to the Bhutanese market. Construction of the plant was expected to be completed in December 2011. Capital for the project came from the Bank of Bhutan, Bhutan National Bank, Druk Punjab National Bank, National Pension and Provident Fund, Royal Insurance Corp. of Bhutan Ltd., Punjab National Bank, State Bank of India, and Union Bank of India (table 2; India Cement & Construction Materials, 2011; Rai, 2011).

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NEPAL

Nepal's mineral resources were mostly unexploited, and its mineral industry was not a significant contributor to the country's economy. Nepal's real GDP growth rate in 2011 was 3.5%. The country produced cement, red clay, coal, limestone, marble, and rolled steel (table 1). In 2011, Nepal's exports increased by 11.7%; exports went mainly to Bangladesh, Germany, India, and the United States. Imports increased by 7.7% and came mainly from China and India (Asian Development Bank, 2011; U.S. Department of State, 2012).

In 2011, through the Asian Development Bank's co-financing operation program, the Organization of the Petroleum Exporting Countries Fund for International Development provided a $20 million loan to Nepal for the country's economic development. In June, Ambuja Cements of India acquired an 85% stake in Nepal's Dang Cement Industries. Dang Cement, which held a limestone mining lease in Nepal, became an Ambuja subsidiary. Limestone is a key raw material in the production of cement, and Ambuja Cements had 25 Mt/yr of cement production capacity in India (Asian Development Bank, 2011; Business Standard, 2012).

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TABLE 1

BHUTAN AND NEPAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity[2]		2007	2008	2009	2010	2011[e]
BHUTAN						
Cement[e]	thousand metric tons	180	180	180	200	200
Coal, bituminous		105,261	123,704	48,545	87,814	80,000
Dolomite		578,552	1,247,568	1,028,993	1,192,374	1,100,000
Ferrosilicon, exports		40,313 [r]	30,824 [r]	90,798 [r]	97,528 [r]	94,000 [e]
Granite	square meters	1,341	199	217	18,731	18,000
Gypsum		189,198	248,445	299,735	344,034	340,000
Limestone		543,964	583,707	591,027	715,956	700,000
Marble	square meters	1,121	1,143	31	--	--
Quartzite		64,049	94,688	82,578	104,580	100,000
Slate	square meters	7,256	764	1,765	--	--
Stone		388,721	408,945	475,614	716,760	700,000
Talc		62,015	56,077	64,381	26,302	26,000
NEPAL						
Cement[e]	thousand metric tons	300	295	295	295	300
Clay, red		35,000	14,135	8,950	9,000	9,000
Coal:						
Bituminous		16,274	13,845	14,819	16,000	16,000
Lignite		98	60	NA	--	--
Total		16,372	13,905	14,819	16,000	16,000
Gemstones:						
Quartz	kilograms	1,110	930	826	1,000	1,000
Tourmaline	do.	5	--	--	--	--
Total	do.	1,115	930	826	1,000	1,000
Salt	thousand metric tons	2	--	--	--	--
Steel, rolled[e]	do.	85	85	85	85	80
Stone:						
Limestone		822,042	701,950	582,999	580,000	580,000
Marble:						
Chips		954	441	1,047	900	900
Slab, cut	cubic meters	22,110	1,781	426	500	500
Craggy	do.	--	--	8,062	--	--
Quartzite[e]		3,100	--	--	3,000	3,000
Talc		9,043	7,996	6,601	9,000	9,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. NA Not available. -- Zero.

[1]Table includes data available through June 21, 2012.

[2]In addition to the commodities listed, crude construction materials, such as sand and gravel and a variety of stone, presumably are produced in Bhutan and Nepal, but information is inadequate to make reliable estimates of output.

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TABLE 2
BHUTAN AND NEPAL: STRUCTURE OF THE MINERAL INDUSTRIES IN 2011

(Thousand metric tons unless otherwise specified)

Country and commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
BHUTAN			
Cement	Dungsam Cement Construction Ltd. (DCCL)	Nganglam, Pemagatshel District	1,300
Do.	Penden Cement Authority Ltd.	Gomtu, Samtse District	348
Dolomite	Jigme Mining Corp. Ltd.	do.	2,000
Ferrosilicon	Bhutan Ferro Alloys Ltd. (Government of Bhutan, Marubeni Co., and Tashi Commercial Co.)	Phuentsholing	34
NEPAL			
Cement	Dang Cement Industries (a subsidiary of Ambuja Cements of India)	NA	NA
Do.	Lhaki Cement Pvt. Ltd.	Bhawani Khola	660
Do.	Hetauda Cement Industries Ltd.	Hetauda	260
Do.	Himal Cement Co. Ltd.	Chobhar	130
Do.	Manasa Cement Industry	Chandragadhi, Jhapa	37
Lead and zinc	Nepal Metal Co. Ltd.	Lari	NA
Magnesite metric tons	Nepal Orind Magnesite Ltd.	Dolkha	50
Marble	Godavari Marble Industries Ltd.	Latitpur	1

[e]Estimated. Do., do. Ditto. NA Not available.

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The Mineral Industry of Brunei

By Pui-Kwan Tse

Brunei (Negara Brunei Darussalam) is located in Southeast Asia on the northwest end of Borneo Island, where it shares a common border with the Malaysian State of Sarawak. Brunei is one of the highest per capita income countries in the Asia and the Pacific region owing mainly to its significant natural gas and oil resources. In addition to the natural gas and oil resources, Brunei also has small resources of carbonate rocks, coal, kaolin, sand and gravel, and silica sand.

The revenue of the natural gas and oil sector accounted for 70% of the country's gross domestic product (GDP). The output of natural gas and oil decreased from a peak of 219,000 barrels per day (bbl/d) in 2006 to 170,000 bbl/d in 2010, which reflected the maturity of the country's oilfields. Also, the Government decided to reduce output to extend the life of the oilfields. Owing to an increase in the prices of natural gas and oil, the country's economic growth rebounded strongly after 2 years of decline, and the GDP grew by 2.6% in 2010 and 2.2% in 2011. The growth of the nonenergy sector increased by 2.1% in the first 9 months of 2011. In 2010 (the latest year for which trade data were available), the country's total trade was $12.6 billion, of which exports were valued at $9.9 billion and imports were valued at $2.7 billion. In 2010, the Republic of Korea was the leading destination for Brunei's oil followed by Australia, Indonesia, and China. Brunei's natural gas production was mainly for export to Japan (Department of Statistics, 2012; International Monetary Fund, 2012, p. 194).

Production

Butra HeidelbergCement Sdn. Bhd., which was the only cement producer in Brunei, was a joint venture between HeidelbergCement Group of the Netherlands (70%) and PJ Corp. Sdn. Bhd. (a local company) (30%). Butra HeidelbergCement had the capacity to produce 500,000 metric tons per year (t/yr) of specialty cement from imported clinker and gypsum at its cement grinding plant, which was located in the Serasa Heavy Industry Zone near Muara. The specialty cement, which is sulfate resistant, was used mainly for oil wells. Domestic demand for cement was about 330,000 t/yr. Owing to competition from imports, utilization of the cement plant was about 50% during the past several years.

The Government of Brunei's Petroleum Unit oversees the development of the natural gas and oil sector. Brunei National Petroleum Co. Sdn. Bhd. (PetroleumBRUNEI), which is a limited-liability company that is wholly owned by the Government, oversees the country's commercial interests in the oil and gas sector. Brunei Shell Petroleum Co. Sdn. Bhd. (BSP), which was the main oil and gas production company in Brunei, was jointly owned by the Government and Royal Dutch/Shell Group of the Netherlands. Its refinery output capacity of 10,000 bbl/d was sufficient to meet domestic demand for most oil products.

In 2010, after 6 years of territorial dispute, the Governments of Brunei and Malaysia signed an Exchange of Letters that identifies the maritime boundaries between the two countries. The two Governments planned next to establish commercial oil and gas agreement areas. The territorial dispute began in 2003 when the Governments of Brunei and Malaysia awarded petroleum production-sharing contracts separately for overlapping deepwater exploration blocks in the South China Sea. The Government of Brunei awarded one of its exploratory blocks to a consortium of Total S.A. of France and the other to a consortium of Royal Dutch/Shell Petroleum Co.; the Government of Malaysia awarded its two blocks to Murphy Oil Co. of the United States. In 2010, the Governments of Brunei and Malaysia signed a joint-development agreement on Block L and Block M. Murphy Oil terminated the agreement with the Government of Malaysia (Oil and Gas Journal, 2010).

Malaysia's state-owned Petroliam Nasional Berhad (Petronas) signed an agreement with PetroleumBRUNEI to participate in new production-sharing contracts. Block L and Block M were renamed Block CA1 and Block CA2, respectively. Block CA1 would be run by a consortium of BHP Billiton Ltd., Canam Brunei Oil Ltd. (Murphy), Hess Corp. Petronas Carigali Brunei Ltd., and Total E&P Deep Water Offshore Brunei. Block CA2 would be explored by a consortium of Canam Brunei Oil, ConocoPhillips Co. of the United States, Diamond E&P B.V. (Mitsubishi) of Japan, Petronas Carigali Brunei, and Shell Deep Water Borneo Ltd. The drilling of these blocks was expected to start in 2012 (Brunei National Petroleum Co. Sdn. Bhd., 2012).

The Government of Brunei approved a proposal by PetroBru Sdn Bhd and TRC Energy Sdn Bhd (a subsidiary TRC Synergy Bhd of Malaysia) to build a second refinery and storage facility in Pulau Murara Besar. TRC held 26% interest in PetroBru. The refinery would be able to process about 500,000 bbl/d of both light and heavy crude oil, and the storage facility would have a designed capacity to store 12.6 million barrels. The construction cost was estimated to be $4.3 billion. The company was awaiting final Government approval for the construction. Most of the refined products would be exported to the North Asia market (especially China, Japan, and the Republic of Korea) (Ecmilbra Investment Research, 2011).

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

Outlook

Brunei's economy is closely tied to the country's oil and gas production. The Government expects that economic growth will be flat if oil production continues to decline in the future and is planning to diversify its economic program into such nonoil sectors as financial services, high-technology manufacturing and services, tourism, and value-added and export-oriented

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industries. During the next 2 years, the country's economic growth is expected to proceed at a much slower pace than that of its neighboring countries, such as Malaysia and Singapore. Construction of the Pulau Murara Besar Port and the power transmission line from Sarawak, Malaysia, to Brunei are expected to support future growth.

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TABLE 1
BRUNEI: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		2007	2008	2009[e]	2010	2011
Cement[e]	thousand metric tons	200	240	220	270	275
Gas, natural:						
Gross	million cubic meters	12,536	12,213	12,100	11,400	12,300
Marketed[e]	do.	11,718 [3]	11,400	11,300 [3]	10,800	11,400
Petroleum:						
Crude[4]	thousand 42-gallon barrels	70,748	63,000	61,000	61,600	59,400
Refinery products[5]	do.	4,438	4,200	4,200	4,200	4,200

[e]Estimated; estimated data are rounded to no more than three significant digits. do. Ditto.

[1]Table includes data available through August 30, 2012.

[2]In addition to the mineral commodities listed, crude construction materials, such as sand and gravel and other varieties of stone, presumably are produced, but available information is inadequate to make reliable estimates of output.

[3]Reported figure.

[4]Includes condensate.

[5]Includes jet fuel, refinery fuel, and refinery losses.

Sources: Prime Minister's Department, Petroleum Unit, and U.S. Geological Survey Minerals Questionnaire 2007.

TABLE 2
BRUNEI: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilitites	Annual capacity[e]
Cement		Butra HeidelbergCement Sdn. Bhd. (HeidelbergCement Group, 70%, and PJ Corp. Sdn. Bhd., 30%)	Near Muara	500
Petroleum, refinery	barrels per day	Seria Oil Refinery [Brunei Shell Petroleum Co. Sdn. Bhd. (BSP) operator]	Belait District of Seria	10,000

[e]Estimated; estimated data are rounded to no more than three significant digits.

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The Mineral Industry of Burma

By Yolanda Fong-Sam

In 2011, Burma, also known as Myanmar, produced a variety of mineral commodities, including cement, coal, copper, lead, natural gas, petroleum, petroleum products, precious and semiprecious stones, tin, tungsten, and zinc. On March 24, a 6.8-magnitude earthquake struck the eastern part of the country just north of Tachileik town in Shan State close to the border with Laos and Thailand. Production of such commodities as brine salt and some semiprecious stones dipped during the period following the earthquake, but the mineral industry in general was not affected, and mineral production overall increased for the year (table 1; CNN.com, 2011; Huffington Post, 2011).

Bangladesh, Burma, and India were involved in maritime boundary disputes concerning their respective sovereignty in the Bay of Bengal. For many years, these countries had attempted to negotiate and delimit their claims in the disputed area. In December 2009, Bangladesh and Burma accepted the jurisdiction of the International Tribunal for the Law of the Sea (ITLOS) for the settlement of the dispute concerning their maritime boundary delimitation. At the time, although accepting ITLOS jurisdiction, the countries had not agreed on a bilateral solution regarding the delimitation principle to be used, and negotiations continued between the countries. ITLOS is an independent judicial body established by the United Nations Convention on the Law of the Sea (UNCLOS) that has jurisdiction to arbitrate disputes arising out of the interpretation and application of the Law of the Sea. UNCLOS establishes a legal framework to regulate ocean space and its resources and uses. In meetings held in January 2010, Bangladesh and Burma agreed to delimit the area by combining the equidistance and equity demarcation principles. In October, Burma and India reached an informal understanding to cooperate with each other on the settlement of their maritime dispute with Bangladesh (Durham University, 2010; International Tribunal for the Law of the Sea, 2010; Priyo.com, 2010).

In September 2011, representatives from Bangladesh and Burma met with the ITLOS in Germany for a final round of pleadings regarding the delimitation of the maritime boundary between the two countries. ITLOS determined that a final judgment would be delivered by March 14, 2012. Burma's border-dispute points with neighboring Bangladesh meet at Rakhine State (Xinhuanet.com, 2011b).

Although Bangladesh and Burma's maritime border dispute had gone on for several years, bilateral trade between the countries has remained at an estimated $140 million per year. The boundary delimitation dispute affected the ability of either country to grant exploration permits for oil and gas in the disputed area, however (Xinhuanet.com, 2011b).

In May 2011, Italian-Thai Development Plc. (ITD), which was a construction company based in Thailand, announced that it had started to build a deep-sea port and industrial estate at a cost of $10 billion. The port was to be located in a 40,000-hectare area in Dawei, Tanintharyi Division, in southern Burma, which is located about 186 kilometers (km) west of Thailand's capital city of Bangkok. The industrial facilities were to include oil and gas pipelines, railways, and roads. The expected commissioning date of the project was not available. In November 2010, the Government of Burma signed a 75-year concession contract with ITD, although no further details were available. The Governments of Burma and Thailand declared the project to be significant for international trade, as it would serve not only countries of Southeast Asia, but also other countries of the Asia and the Pacific region, as well as the countries of Africa, Europe, and the Middle East (BBC News, 2011).

By the end of 2011, the Burmese Government announced that it was suspending the construction of the Myitsone Dam, which was originally proposed to be built in Kachin State and was to become part of a network of dams that would have provided power to southern China. The dam had a projected cost of $3.6 billion, which was to be covered by Chinese investors. The suspension of the project was mainly because of environmental concerns and pressure by the communities that would be directly affected by the structure. China had numerous contracts and investments already in place in Burma; however the Government of Burma was concerned that the suspension of the construction of the dam not affect other projects (Irrawaddy, The, 2011b; International Cement Review, 2012, p. 120).

Government Policies and Programs

The Government of Burma seeks to encourage the participation of foreign and local investors in part to draw in industry experts who have the knowledge to develop the country's mineral industry. The Union of Myanmar's Mineral Law went into effect in September 1994, and the rules related to the law were implemented in December 1996. The Ministry of Mines is the Government entity responsible for implementing the Government's mineral policy, for planning, and for enforcing the laws and regulations related to the mining sector. The Ministry evaluates and processes all license applications for the prospecting for and production and beneficiation of minerals in accordance with the Mineral Law and regulations; it also monitors production operations and promotes investment in the mineral sector. According to the Mineral Law, any naturally occurring minerals found on or under Burmese soil and on Burma's Continental Shelf belong to the state (Ministry of Mines, undated a, b).

In January 2011, the Government announced its plans to privatize approximately 90% of the state-owned industries within 1 year. The remaining 10% was to be held by the Government. In addition to state-owned industries, the other state-owned properties that were listed for privatization included buildings, bridges, enterprises, ports, recreation centers, roads, and gas stations, among others. According to the Government, in 2010, a total of 246 gas stations, 110 state-owned enterprises, 32 buildings, and 8 wharves in the Yangon Port were sold

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(Irrawaddy, The, 2011a; South-East Asia & South Asia Infoport, 2011).

Production

During 2011, Burma's mineral industry reported estimated sharp increases and decreases in the production of minerals compared with that of 2010. The data marked as estimated for year 2011 in table 1 are based on the latest available data published in the Central Statistical Organization's "Selected monthly economic indicators," which includes data only for the first 9 months of 2011. Therefore, estimates are based mostly on the performance of the industry until September 2011 and assume that the rate of production continued until December 2011. In the metals mining sector, major increases in production were estimated for mined lead and mined tin (in tin ores and concentrates) whereas decreases were estimated for copper, manganese, and tungsten (in tin-tungsten concentrate). In the industrial minerals sector, production of barite, jade, and sapphire were estimated to have increased whereas production of dolomite, gypsum, and ruby were estimated to have decreased. Production of coal, natural gas, and petroleum refinery products were also estimated to have increased (table 1).

Mineral Trade

Trade data for 2011 discussed in the following paragraphs are from information reported by the Government of Burma through its Central Statistical Organization and cover the months of from January through September, which is the latest period for which data were available. Burma's total trade value for the first 9 months of 2011 was $14.11 billion,[1] of which exports totaled $7.048 billion and imports totaled $7.066 billion. Although the data represented only 9 months of the year, the trade value increase is noticeable when compared with the total value of trade for the full 12 months of 2010 of $13.74 billion (Central Statistical Organization, 2011, p. 1, 50).

For the first 9 months of 2011, the value of natural gas exports was about $2.6 billion; that for base metals and ores was about $38.2 million. The main mineral commodities imported by Burma in 2011 were base metals and manufactured goods, which as of September represented 8.7% of total imports and were valued at $614.2 million; cement imports, which represented 2% of total imports and were valued at $144.2 million; and coal and coke imports, which represented about 1% of total imports and were valued at $6.5 million (Central Statistical Organization, 2011, p. 5–7, 16).

Thailand remained Burma's primary export partner in 2011, followed by China, India, Hong Kong, and Singapore; these countries received, about 84% of Burma's total exports. For the first 9 months of 2011, the value of Burmese exports to Thailand was estimated to be $2.85 billion (or about 40% of the country's total exports); China, $1.2 billion (about 17% of total exports); India, $820.7 million (about 12% of total exports); Hong Kong, $541.9 million (about 8% of total exports); and Singapore, $484.6 million (about 7% of total exports). China remained Burma's major import partner; for the first 9 months of 2011, the value of imports from China was estimated to be $2.2 billion (about 31% of total imports); Singapore, $2.1 billion (about 30% of total imports); and Thailand, $532.6 million (about 7.5% of total imports) (Central Statistical Organization, 2011, p. 9–10, 18–19).

For the first 9 months of 2011, foreign direct investment in Burma totaled $4.12 billion distributed among 21 projects, including 5 in the oil and gas sector, 3 in the mining industry, and 1 in a power generation project; as well as projects in the agricultural and manufacturing sectors. Burma's main foreign investor was China, which invested about $3.2 billion in the power generation sector; Hong Kong invested approximately $400.6 million in a total of three mining projects, which the Burmese Government reported as including Myanmar Yang Tse Copper Ltd.'s project ($396.4 million) and Myanmar Tah Hsin Industrial Co. Ltd.'s project ($1.5 million); Singapore and the Republic of Korea invested $186.1 million and $181.3 million respectively, in the oil and gas sector (Central Statistical Organization, 2011, p. 52–59).

Structure of the Mineral Industry

Table 2 is a list of Burma's major mineral industry facilities.

Commodity Review

Metals

Copper.—In August 2011, Ivanhoe Mines Ltd. of Canada announced that it had received $103 million from the Monywa Trust in partial payment of a promissory note for Ivanhoe Mines' interest in the Monywa Copper Project. The Monywa Copper Project, which was Burma's main copper asset, had been a 50-50 joint venture between Ivanhoe Myanmar Holdings Ltd. (a wholly owned subsidiary of Ivanhoe Mines) and state-owned Mining Enterprise No. 1. In February 2007, however, ownership of the project was transferred to an independent third party trust to await the sale of Ivanhoe Mines' interest in the property; in exchange, the trust issued Ivanhoe Mines a promissory note. The Canadian company operated in Burma through Myanmar Ivanhoe Copper Co. Ltd. (Monywa JVCo.). Ivanhoe Mines reported that it had not been involved in the Monywa Copper Project since the transfer of the company's interest in the property in 2007 (Ivanhoe Mines Ltd., 2011).

In April 2011, a production-sharing contract for copper mining at Monywa was signed between the Chinese company China North Industries Corp. (NORINCO) and state-owned Union of Myanmar Economic Holdings Ltd. during a visit of top-ranking officials from China. The contract was for the development of the copper mine at Monywa; additional details on the terms of the contract were not available (Guardian, The, 2011).

Nickel.—On March 27, the Ministry of Mines announced the opening of the Tagaung Taung nickel ore project, which would include a mine and a smelter, at Thabeikying, Mandalay Division, in central Burma. The project was jointly owned by China Nonferrous Metal Mining Group Co. Ltd. (CNMC) of China and Taiyuan Iron and Steel Co. (TISCO) of China, and was operated by CNMC under a production-sharing contract with state-owned Mining Enterprise No. 3. The smelter was

[1]Where necessary, values have been converted from Myanmar kyat (K) to U.S. dollars (US$) at the rate of K 5.38=US$1.00 for 2011.

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expected to start operation sometime during 2012. According to the Ministry of Mines, the project would have the capacity to produce 85,000 metric tons per year (t/yr) of ferronickel and about 20,000 t/yr of nickel when fully operational (Myanmar Times, The, 2011; Xinhuanet.com, 2011a).

In September, the Ministry of Mines announced that it was working with various Government ministries and private companies to improve power generation in some areas of the country, especially those areas with great potential for the development of nickel and chromite deposits. The Ministry stated that there was great potential for mining in Chin State (in western Burma) once reliable power sources are available to sustain the demand for electricity by nickel and chromite producers. Nickel deposits had been identified within Chin State in such areas as Hachalay, Mwe Hill, Nat Hill, and Webula Hill; chromite deposits had been identified in such areas as Bopibun, Falam, Hachalay, Maungtaw-Hnamataw, Muwelut, Mwe Hill, Nat Hill, and Webula Hill. According to the Ministry of Mines, these deposits could yield more than 100 million metric tons of nickel ore and 38,000 metric tons of chromite. Several mining companies, including China Nonferrous Metal Industry's Foreign Engineering & Construction Co. Ltd., Guilin Research Institute of Geology for Mineral Resources, and Kingbao Mining Ltd. of Hong Kong, were working with the Ministry to conduct preliminary surveys and exploration studies of the identified areas (Myanmar Business Network, 2011).

Zinc.—In September 2009, South East Asia Metals Co., Ltd. (SEAMET), which was a subsidiary of Padaeng Properties Co., Ltd. of Thailand, entered into an agreement with Mayflower Mining Enterprises Ltd. (MME) in which SEAMET obtained the operating rights to a mining concession owned by MME. MME had rights to the concession until 2015. In April 2011, Padaeng announced that SEAMET had entered into a $4 million service agreement for the mining concession with Mali Mining & Metallurgy Pte. Ltd. (Mali). According to the agreement, Mali would upgrade the zinc facility so it could process low-grade material to a concentrate grading a minimum of 30% zinc. SEAMET submitted an initial payment of $984,000 to Mali in October. Future plans for the project included an exploration program in 2012 to assess the remaining resources of zinc contained in the deposits and exploration activities in search of new deposits. The project is located in Burma, but no further details were available regarding the exact location of the zinc project (Padaeng Industry Public Co., Ltd., 2011, p. 25, 62).

Industrial Minerals

Cement.—Based on industry estimates, Burma has the capacity to produce approximately 3.46 million metric tons per year (Mt/yr) of cement, although most of the facilities lack the ability to operate at full capacity. In 2011, four cement plant proposals were approved for development by the Myanmar Investment Commission (MIC); three out of the four projects started construction before the end of the year. (The MIC is under the Ministry of National Planning and Economic Development and is the Government agency responsible for evaluating domestic and foreign investment proposals). Each of the projects would have the capacity to produce 1,000 metric tons per day of cement. Two of the plants were to be located in central Burma at Pyinyaung in the Mandalay Region and were owned by Htoo Cement Co. Ltd. and Shwe-Taung Cement Co. Ltd., respectively. Another plant was proposed to be built between the towns of Taungyi and Hopone in Shan State by Kanbawza Cement Ltd.; this project was expected to be commissioned in early 2013. The fourth plant was proposed to be built in Naungcho in northern Shan State (about 100 km east of Mandalay) by Ngwey Yi Pale Mining Co. Several other cement project proposals were under consideration by the MIC. In 2011, Siam City Cement Plc. (SCCC) of Thailand indicated that the company was still considering the construction of a cement plant in Burma, following an official announcement made in November 2010 in which the company released the results of a feasibility study that it had conducted earlier in the year. PT Semen Gresik of Indonesia was also considering building a cement plant in Burma as the cement was in high demand in Burma. Some companies were proceeding cautiously, however, and decisions on investment were likely to depend on changes in the Government investment and mine ownership policy (International Cement Review, 2012).

Mineral Fuels

Oil and Gas.—The construction of the Shwe gas pipeline continued through 2011. The oil and gas pipeline, which was projected to cost an estimated $1.5 billion, was to run from the Bay of Bengal in Arakan State in west Burma, through the central and the northeastern part of the country, to Yunnan Province in China. The project, which was expected to be commissioned in mid-2013, was to be built and operated by China National Petroleum Corp. (CNPC) and unspecified partners from India and the Republic of Korea. When finished, the pipeline would total 3,900 km in length, of which 2,800 km would have the capacity to carry 12 million cubic meters per year of natural gas and 1,100 km would have the capacity to carry 22 Mt/yr of crude oil that had been transported to the coast of Burma by tanker from Africa and the Middle East. The pipeline would increase China's energy supply and also shorten the distance for transporting oil from Africa and the Middle East by creating a shortcut to bypass the Strait of Malaca. CNPC held the right to purchase and export all the natural gas generated in the Shwe gasfield through a 30-year exclusive purchase agreement signed during Burma's previous Administration. In addition to the pipeline, China was also building a deep-sea port to unload crude oil and an oil storage facility on the island of Maday, which is located off the coast of Arakan State. When completed, the port will provide China with access to the Indian Ocean (Corben, 2011; Irrawaddy, The, 2011b).

On January 6, Sinopec International Petroleum Corp. (SIPC), which was a subsidiary of China Petroleum & Chemical Corp. (Sinopec), announced that it had discovered proven reserves of about 25.74 billion cubic meters of natural gas (reported as 909 billion cubic feet) and 7.16 million barrels of condensate in the Pahtolon oilfield in central Burma. The discovery was made by SIPC Myanmar Petroleum Co. Ltd., which was a joint venture between state-owned Myanma Oil and Gas Enterprise (MOGE) and Sinopec (Reuters.com, 2011).

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On February 14, SIPC Myanmar Petroleum announced another gas deposit discovery; this new discovery is located about 835 km northwest of Yangon in the Mahutaung region. The discovery was made by conducting tests on six wells in onshore Block D. According to company estimates, the deposit had a capacity to yield approximately 59,500 cubic meters per day of gas (reported as 2.1 million cubic feet per day) (Gas and Oil, 2011).

Outlook

Following the elections of November 2010 and the appointment of a new President in January 2011, Burma has begun instituting notable political and economic reforms. In an effort to boost the country's economy, the Government has sought to have the economic sanctions imposed by the European Union and the United States lifted. The effort may yield some results in the near future as several countries have demonstrated interest in investing in Burma and held talks with the new Government. The private sector involvement in the country's mineral exploration business has increased since 2009 owing to the effort of the Government to privatize many of its industries, including mining. The country is in a political and economic transition that is opening opportunities for business competition, especially as foreign direct investment increases.

The exploration for and production of metals and industrial minerals is expected to increase as new developments and expansion projects progress and mines and plants start being commissioned in the next few years. This increase will be noticeable particularly in the cement production sector, as many foreign direct investments have been approved by the Government for the construction of new plants. The increase in cement demand will be directly influenced by the Government's infrastructure plans, which include the construction of oil and gas pipelines to China, highways and transportation projects, and a number of deep-sea ports. The development of other mining projects will also be subject to the continuing demand for mineral commodities from neighboring countries and will depend on world market prices. The supply of natural gas for domestic use is expected to increase in the next 2 years following major pipeline projects coming on stream and because of the recent gasfield discoveries made in 2011.

In the near future, it is expected that the country will increase its ties with countries in the West. The financial sanctions against Burma are likely to ease if the country continues its path toward a more democratic and open society. An increase in business between Burma and neighboring countries, such as China, India, and the Republic of Korea, is likely to continue, particularly as these countries have already established mining investments in Burma. The privatization of about 90% of the state-owned industries and the continuing openness of the country to promote its mineral industry have contributed to increased investment in Burma.

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TABLE 1
BURMA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2007	2008	2009	2010	2011
METALS						
Copper:						
Mine output, Cu content		13,900	--	3,500	12,000	10,000
Matte, gross weight[e, 3]		80	80	80	80	80
Metal, refined		13,900	--	3,500	12,000	10,000
Lead:						
Mine output, Pb content[e, 4]		1,000 r	1,000 r	5,000 r	7,000	8,700
Metal:						
Refined		165	202	200	--	--
Manganese, mine output, Mn content[e]		19,400 r	142,600 r	242,900 r	299,900 r	234,400
Silver, mine output, Ag content[4]	kilograms	218	--	249	--	--
Tin, mine output, Sn content:[5, 6]						
Of tin ores and concentrates		8,000	800	1,000	4,000	11,000
Metal, refined[e]		30	30	30	30	30
Total		8,030	830	1,030	4,030	11,030
Tungsten, mine output, W content:[4]						
Of tungsten concentrate		4	5	4	2	--
Of tin-tungsten concentrate		179	131	83	161	140 e
Total		183	136	87	163	140
Zinc, mine output, Zn content[4]		10,000	7,000	6,000	7,000	7,000
INDUSTRIAL MINERALS						
Barite		6,813	5,679	7,623	8,975	30,000 e
Cement, hydraulic		608,192	675,788	669,941	534,034	538,000 e
Clays, bentonite[e, 3]		971	1000	1,000	1,000	1,000
Feldspar[e, 3]		10,000	10,000	10,000	10,000	10,000
Gypsum		75,116	82,224	97,518	81,051	50,000 e
Nitrogen, N content of ammonia[e]		30,000	30,000	30,000	30,000	30,000
Precious and semiprecious stones:						
Jade	kilograms	20,003,409	30,896,440	25,427,237	38,990,035	45,000,000 e
Diamond[e]	carats	5	5	5	5	5
Rubies	do.	1,394,939	1,868,696	1,674,579	1,612,070	870,000 e
Sapphires	do.	608,008	1,129,039	795,228	1,311,327	1,500,000 e
Spinel	do.	843,680	572,308	296,956	618,730	620,000 e
Salt, brine		71,323	54,355	133,358	97,136	100,000 e
Stone:						
Dolomite		4,674	4,264	4,390	3,119	2,000 e
Limestone, crushed and broken[e]	thousand metric tons	3,800	4,000	4,000	3,200	3,200
MINERAL FUELS AND RELATED MATERIALS						
Coal, lignite		283,703	249,442	245,418	217,650	300,000 e
Gas, natural, marketed	million cubic meters	13,315	12,445	11,555	12,425	12,500 e
Petroleum:						
Crude	thousand 42-gallon barrels	7,625	7,242	6,881	6,806	6,400 e
Refinery products[7]	do.	4,885	4,661	4,139	4,851	5,000 e

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. -- Zero.

[1]Table includes data available through January 10, 2013.

[2]In addition to the commodities listed, construction aggregates, gold, iron and steel, lead (antimonial), nickel, sand and gravel, and silica sand are produced, but available information is inadequate to make reliable estimates of output.

[3]Data are for fiscal year ending March 31 of the following year.

[4]Data are for the production by the state-owned mining enterprises under the Ministry of Mines.

[5]Production of tin, mine output, Sn content production, in metric tons, reported by the Government was 2007—499; 2008—499; 2009—518; 2010—374; and 2011—350 (estimated).

[6]Data compiled from the United Nations Comtrade database for tin ores and concentrates imported from Burma by China, Malaysia, and Thailand.

[7]Includes diesel, distillate fuel oil, gasoline, jet fuel, kerosene, and residual fuel oil.

Sources: Ministry of Mines and Central Statistical Organization (Yangon), Statistical Yearbook 2009; Selected Monthly Economic Indicators, May 2008, January 2009, January 2010, December 2010, and September 2011.

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TABLE 2
BURMA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		AAA Cement International Co. Ltd.	Cement plant in Kyaukse, Mandalay Division	180,000
Do.		Dragon Cement	Cement plant in Pinlaung, Shan State	180,000
Do.		Mandalay Cement Industries Co. Ltd.	Cement plant in Kyaukse, Mandalay Division	135,000
Do.		Max Cement	Cement plant in Aung Nan Cho Village, Lewe, Naypyidaw Township, Mandalay Division	150,000
Do.		Myanma Ceramic Industries	Cement plant in Kyangin, Ayeyarwady	363,000
Do.		do.	Cement plant in Kyaukse, Mandalay Division	120,000
Do.		do.	Cement plant in Thayet, Magway Region	170,000
Do.		Myanmar Economic Co. Myaing Galay 1	Cement plant in Hpa An, Kayin	240,000
Do.		Myanmar Economic Co. Myaing Galay 2	do.	1,200,000
Do.		Naypyidaw Development Committee	Cement plant in Naypyidaw Township, Mandalay Division	150,000
Do.		Tiger Head Cement (Myanmar)	Cement plant in Kyaukse, Mandalay Division	90,000
Do.		Union of Myanmar Economic Holdings Ltd. Sin Min 1	do.	330,000
Do.		Union of Myanmar Economic Holdings Ltd. Sin Min 2	do.	NA
Do.		Yangon City Development Committee	Myodaw cement plant in Thazi Mandalay Division	150,000
Coal		Mining Enterprise No. 3 (ME–3)	Kalewa coal mine in Sagaing Division, near Kalewa	13,000
Copper		Mining Enterprise No. 1	Monywa copper project, S&K Mine, and Monywa refinery, in Monywa region, central Burma	40,000
Fertilizer, N content		Myanma Petrochemical Enterprise (Government, 100%)	No. 1 fertilizer plant at Sales, 190 kilometers southwest of Mandalay	94,900
Do.		do.	No. 2 fertilizer plant at Kyun Chaung, central Burma	75,555
Do.		do.	No. 3 fertilizer plant at Kyaw Zwar, central Burma	219,000
Natural gas	million cubic meters	Total E&P Myanmar, 31.2%; Chevron Corp., 28.26%; PTT Exploration and Production Public Co. Ltd. (PTTEP), 25.5%; Myanma Oil and Gas Enterprise (MOGE), 15%	Yadana gasfield in Moattama, Gulf of Martaban	7,227
Do.	do.	Petronas Carigali Myanmar Inc., 40.91%; Myanma Oil and Gas Enterprise (MOGE), 20.45%; PTT Exploration and Production Public Co. Ltd. (PTTEP), 19.32%; Nippon Oil Exploration (Myanmar) Ltd., 19.32%	Yetagun gasfield in Tanintharyi, Gulf of Martaban	4,635
Do.	do.	Myanmar Petroleum Resources Ltd. and Myanma Oil and Gas Enterprise (MOGE)	Mann oilfield, south of Yangon	37

See footnotes at end of table.

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TABLE 2—Continued
BURMA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum:				
Crude	thousand 42-gallon barrels	Myanmar Petroleum Resources Ltd. and Myanma Oil and Gas Enterprise (MOGE)	Mann oilfield, south of Yangon	876
Refined	do.	Myanma Petrochemical Enterprise (Government, 100%)	No. 1 refinery at Thanlyin (near Yangon)	9,490
Do.	do.	do.	No. 2 refinery at Chauk, central Burma	2,190
Do.	do.	do.	No. 3 refinery at Thanbayakan, central Burma	9,125
Steel		Pohang Iron and Steel Co. (POSCO) (70%)	Pohang Iron and Steel Co. (POSCO) steel plant in Yangon	30,000

Do., do. Ditto. NA Not available.

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The Mineral Industry of Cambodia

By Yadira Soto-Viruet and Yolanda Fong-Sam

Cambodia's mineral industry was dominated by the production of industrial minerals, which included crushed stone, limestone, and sand and gravel. The country's undeveloped mineral resources included bauxite, copper, gold, offshore oil and gas, and titanium. The country's exports to the United States were valued at about $2.7 billion in 2011 compared with about $2.3 billion in 2010. Advanced iron and steel products accounted for about $359,000 of these exports. Imports from the United States were valued at about $186 million in 2011 compared with about $154 million in 2010. These included nearly $2.2 million of excavating machinery and $639,000 of drilling and oilfield equipment (U.S. Census Bureau, 2012a, b).

Government Policies and Programs

The Ministry of Industry, Mines and Energy (MIME), which implements Cambodia's mineral law and policy, is the Government entity that leads the effort to promote and develop the industrial sector in the country. The Department of Geology and Mines and the Department of Energy, which are both under the MIME, coordinate the development of the energy and mineral sectors. The policy governing foreign direct investment (FDI) in the country is based on the Law on Investment of the Kingdom of Cambodia, which was enacted in 1994. The objective of the law is to manage foreign investments in the country efficiently. The investment law provides incentives for private investment, as well as comparable treatment for domestic and foreign investors, except with respect to land ownership. In accordance with Cambodia's Constitution, foreign investors may not own land but may lease the land for a period of up to 70 years with the option to renew from then on. The Government also provides guarantees that the foreign-owned assets will not be nationalized and that the prices for goods produced and services provided by the investor will not be regulated. The investment law also allows foreign investors to own 100% of their mining investments and to employ skilled workers from overseas in the cases where workers cannot be found in the domestic labor force. Under the investment law, the Government created the Council for the Development of Cambodia (CDC), which oversees the investment policy and assists investors in all regulatory aspects of doing business in the country. The CDC, through the Cambodian Investment Board, processes and evaluates all proposals for exploration and is required to respond to each application within 45 days of submittal; if the application is approved, the CDC grants an exploration license. If exploration is successful, the CDC is responsible for granting the mining license to the investors; a mining project plan or proposal is required as a condition for acquiring a mining license (Investincambodia.com, 2012, 2013).

Production

In 2011, laterite production decreased by 7% to 1.5 million metric tons (Mt) from about 1.6 Mt in 2010. Production data for other mineral commodities included in table 1 were estimated for 2011.

Structure of the Mineral Industry

In 2011, the MIME issued exploration and mining licenses to 24 domestic and foreign companies, which included companies from Australia, China, Thailand, the United States, and Vietnam. As of December, the country had granted mining licenses to a total of 128 domestic and foreign companies (People's Daily Online, 2012). Table 2 is a list of major mineral industry facilities.

Commodity Review

Metals

Bauxite and Alumina.—Vietnam National Coal and Mineral Industries Holding Corp. Ltd. (Vinacomin) continued with its plans to explore for bauxite resources in an area of Mondol Kiri Province that covers about 1,500 square kilometers (km²). The area is located in eastern Cambodia adjacent to the border with Vietnam's Dak Nong Province. The company planned to complete a resource assessment for the area by 2013 (Vietnam National Coal and Mineral Industries Holding Corp. Ltd., 2011).

Gold.—Southern Gold Ltd. of Australia held a total of seven exploration licenses for gold and base metals in areas totaling 1,500 km² located in several Provinces in eastern Cambodia. The company held a 49% interest in the Kratie South project, which included the O'Khtung and the Preak Khlong prospects. In May, Japan Oil, Gas and Metals National Corp. (JOGMEC) earned 51% interest in the Kratie South project as part of a joint-venture agreement signed in 2008. In June, the company reported gold assays of up to 5 meters at an average grade of 5.22 grams per metric ton at the Preak Khlong northwest prospect. During the year, JOGMEC reported that it was to write off its earning interest in the Kratie North project; as a result of the writeoff, ownership of the project returned to Southern Gold (100% interest). Southern Gold also held 100% interest in the Memot, the Phnum Romdul, and the Srae Pok projects (Southern Gold Ltd., 2011, p. 5, 12–13, 17).

Other companies exploring for gold in the country included Australian companies Brighton Mining Group Ltd., Indochine Mining Ltd., and OZ Minerals Ltd., and Canadian company Angkor Gold Corp.

Iron Ore.—Hoang Anh Gia Lai Group of Vietnam held a cooperation agreement with the MIME to survey an iron ore mine in the country, which is located in the Quayday District in the Province of Rotanokiri. During the year, the company submitted all the required documents to the MIME for the

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exploitation of the iron mine site, which covers an area of about 154 km² and had estimated reserves of 30 Mt of iron ore (Hoang Anh Gia Lai Group, 2010, 2011).

By yearend 2010, the Wai Chun Mining Industry Group Co. Ltd. of the Cayman Islands entered into a heads of agreement (HOA) with Guangxi Non-Ferrous Metal Group Co. Ltd. of China and Guangxi Sincerity Investments & Trading Co. Ltd. of China to acquire the entire interest in two iron mines in the Kohkeo and the Phnom Thmar regions. The HOA included the possible acquisition of the mines from Guangxi Non-Ferrous Metal at a cost of about $259 million. In March, the companies announced the end of the HOA, stating that they were unable to agree on the final structure and terms of the definitive agreements (Wai Chun Mining Industry Group Co. Ltd., 2010; 2012, p. 4).

Industrial Minerals

Cement.—In 2010, state-owned Chip Mong Group signed a memorandum of agreement with Siam City Cement Plc. (SCCC) of Thailand for the construction of a new cement plant in the Province of Kampot,at a cost of about $150 million. The plant, which would have a production capacity of about 1 million metric tons per year (Mt/yr) of cement, was expected to be operational within 5 years. At yearend 2011, the feasibility study for the construction was extended into 2012 (Cemnet.com, 2011a, b; Siam City Cement Public Co. Ltd., 2011, p. 9).

Mineral Fuels

Natural Gas and Petroleum.—Chevron Corp. of the United States operated the offshore oilfield Block A, which is located about 200 kilometers (km) off the coast of Cambodia in the Gulf of Thailand. The company held a 30% interest in Block A, which covers 4,709 km². In 2010, Chevron submitted a request to the Government for a 30-year production permit; the company expected to receive the approval and final investment decision by yearend 2012. The development included a wellhead platform and a floating storage and offloading vessel. As of yearend 2011, no proven reserves had been determined. Chevron also held other offshore interests in the Cambodia-Thailand overlapping claim zone in the Gulf of Thailand, which was under a maritime boundary dispute between the countries. The company's interests in the zone ranged from 30% to 80%, but owing to the unresolved boundary issue, the area remained inactive as of 2011 with the exception of Block A (Chevron Corp., 2012, p. 26–27).

In 2010, the Cambodian National Petroleum Authority and JOGMEC signed an agreement for a study and survey program in Block 17 onshore Cambodia. Block 17 covers an area of about 6,500 km² and is located about 200 km northwest of Phnom Penh in the Province of Kampong Thum. In June, the joint venture completed a geological survey and sample analysis onshore in northern Cambodia. An environmental impact assessment for the two-dimensional (2-D) seismic survey in Block 17 was conducted by International Environmental Management Co. Ltd. of Thailand and was approved by the Ministry of Environment in January 2012. The joint venture expected to begin the 2-D seismic survey by February 2012. The joint venture also selected Moeco Cambodia Oil and Gas Co. Ltd. to be the operator (Japan Oil, Gas and Metals National Corp., 2011, p. 5, 9; 2012, p. 9; Coordinating Committee for Geosciences Programmes in East and Southeast Asia, 2012, p. 2, 6).

The joint venture among Cambodian Petrochemical Co., China National Automation Control System Corp., and Sino March Co. of China planned to build the first crude oil refinery in the country at a cost of about $2 billion. The refinery would have a production capacity of about 37 million barrels per year (5 Mt/yr) of crude oil and would be located on the boundary of Kampot and Sihanoukville Provinces. The construction of the new refinery was expected to begin in April 2012 (CBRE Group, Inc., 2011).

Outlook

The construction of the first crude oil refinery represents an important step in the future development of Cambodia's mineral fuels sector. In the longer run, new projects in the nonfuel mineral sector, such as the possibility of developing bauxite, gold, and iron ore deposits, are likely to provide significant revenue to the Government. The country's lack of proper infrastructure will continue to present challenges to investors in the short run. The country's infrastructure is likely to be revamped in the next 5 to 10 years if proposed infrastructure developments, such as the construction of a hydroelectric powerplant, railroads, and roads, come to fruition as part of the planned investments. These projects will likely increase consumption of construction materials, including cement, crushed stone, and sand and gravel. These developments are likely to attract FDI in the mineral sector and to increase interest in nonfuel mineral prospecting.

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TABLE 1
CAMBODIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons)

Commodity[2]	2007	2008	2009	2010	2011
Cement	86,990	772,029	933,900	789,025	800,000 e
Gravel	36,250	37,500 e	41,875	82,500	82,500 e
Laterite, blocks	312,718	454,750	631,000	1,612,500	1,500,000
Salt	76,651	78,000 e	NA	NA	NA
Sand, construction material	329,028	6,581,500	14,035,775	38,367,500	40,000,000 e
Stones:					
Crude construction material	1,433,086	2,039,336	2,819,804	6,331,000	6,300,000 e
Limestone[e]	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

[e]Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

[1]Table includes data available through January 10, 2013.

[2]In addition to the commodities listed, clay, gemstones, gold, and iron ore presumably are produced, but available information is inadequate to make reliable estimates of output.

Source: Cambodia's Ministry of Industry, Mines and Energy, General Department of Mineral Resources; U.S. Geological Survey Minerals Questionnaires for Cambodia, 2007 through 2010.

TABLE 2
CAMBODIA: STRUCTURE OF MINERAL INDUSTRY IN 2011

(Thousand metric tons)

Commodity	Main operating companies and main equity owners	Location of main facilities	Annual capacity[e]
Cement	Kampot Cement Co. Ltd. (a joint venture between Siam Cement Group of Thailand, 90%, and Khaou Chuly Group, 10%)	Touk Meas District, Kampot Province	1,000
Gemstones	Jirech International Cambodia Construction and Import-Export Co. Ltd.	Anlong Krapeu-Preak Bey, Samlot District, Batdambang Province	NA
Do.	Seoul Digem Cambodia Co. Ltd.	Loamphat District, Rotanokiri Province	NA
Do.	Sonuba Cahm Industries Co. Ltd.	Phnom Trop, Pailin City	NA
Do.	Ultra Marine Kiri (Cambodia) Ltd.	Pating Thom Village, Ting Chak Commune, Borkeo District, Rotanokiri Province	NA
Do.	do.	Sen Chauv, Samlot District, Batdambang Province	NA
Granite	TTY-Rithy Mexico	Svay Chreas District, Kracheh Province	NA
Limestone	Kampot Cement Co. Ltd.	Tatung, Kampot Province	1,500
Do.	Thai Boon Roon Cement Co. Ltd.	Phnom Laang Laan Commune, Donghtung District, Kampot Province	NA
Do.	United International (Cambodia) Foreign Investment Group Co. Ltd.	East Touk Meas, Banteay Meas District, Kampot Province	NA

[e]Estimated. Do., do. Ditto. NA Not available.

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THE MINERAL INDUSTRY OF CHINA

By Pui-Kwan Tse

China ranked second behind the United States as the world's leading economic power and was a leading mineral producing and consuming country. In 2011, China's economy remained strong even as most of the developed countries in the West were trying to recover from recession. During the past two decades, China's economic growth was created by a combination of trade and investment, which greatly affected the global commodity market. China imported significant amounts of raw materials and transformed the materials into products for export. The country's demand for energy, minerals, and metals was particularly strong. During the 1980s and 1990s, China's commodity exports went primarily to the United States and Europe; however, during the past several years, intraregional trade in Asia increased significantly, which benefited other emerging economies in Asia, especially those that exported raw materials to China. Strong Chinese demand for natural resources and energy resulted, for example, in large volumes of Australian exports and an increase in Australian jobs and investment (Australian Bureau of Resources and Energy Economics, 2012, p. 18).

The Chinese Government set the country's targeted economic growth rate at 7% in its 12th 5-year plan (2011 through 2015), but the actual rate of growth was higher than the targeted rate. In 2011, the growth in the gross domestic product (GDP) decreased from 9.7% in the first quarter to 8.9% in the fourth quarter. For the year, the GDP growth rate was 9.3% compared with 10.4% in 2010. The slowing of economic growth was attributed to weaker investment and slow growth in the economies of the United States and the European Union, which limited their net exports. Also, the Government tightened monetary and credit policies to contain inflation, particularly in the infrastructure and the real estate sectors (National Bureau of Statistics of China, 2012a, p. 1–9).

The slower rate of growth in China was expected to affect the economic development of other countries in the Asia and the Pacific region, given China's increasing role as an export destination for mineral commodities. As a result, the economic growth of such natural resource exporting countries as Australia, Burma, Indonesia, Mongolia, and Vietnam was expected to slow down (National Bureau of Statistics of China, 2012a, p. 1–9; Citigroup Global Market Inc., 2012a, p. 19).

In 2011, the consumer price index increased by 5.4% compared with an increase of 3.3% in 2010. The country's fixed-asset investment increased by 23.6% to $4.9 trillion, of which the mining sector (including coal, gas, and oil) received $187 billion; the nonmetallic sector received $166 billion; and the ferrous and nonferrous metal sectors received $61 billion each. China's long-term challenge was to continue its economic growth towards a more sustainable path. The GDP growth in the next decade was expected to be slower than during the past two decades (National Bureau of Statistics of China, 2012a, p. 1–9).

During the next decade, China was expected to face the shrinkage of its labor force because of the adoption of the one child policy in the latter part of the 20th century. China's investment-to-GDP ratio was high (49.7% in 2011) compared with that of the Republic of Korea, 29.5%; Taiwan, 21.1%; Japan, 19.9%; and the United States, 15.9%. Also, the country was likely to be confronted with social and environmental issues that had been ignored during the past two decades of development (Citigroup Global Market Inc., 2012a, p. 7; National Bureau of Statistics of China, 2012a, p. 1–9).

Minerals in the National Economy

China is rich in mineral resources and was the world's leading producer of aluminum, antimony, barite, bismuth, cement, coal, fluorspar, gold, graphite, iron and steel, lead, magnesium, mercury, molybdenum, phosphate rock, rare earths, salt, talc, tin, tungsten, and zinc in 2011. China ranked among the top three countries in the world in the production of many other mineral commodities. China was the leading exporter of antimony, barite, fluorspar, graphite, indium, rare earths, and tungsten in the world. The country's demand for chromium, cobalt, copper, iron ore, manganese, nickel, petroleum, platinum-group metals, and potash exceeded domestic supply, and imports were estimated to account for more than 40% of domestic consumption. Mineral trade accounted for about 25% of the country's total trade. China was one of the few countries whose domestic supply of and demand for a variety of mineral commodities affected the world mineral market. The labor force in the mining sector was 6.11 million, or 4.2% of the country's total workforce in 2011 (National Bureau of Statistics of China, 2012b, p. 130).

Government Policies and Programs

China's rapid capital-intensive, export-oriented growth has been successful during the past three decades; however, the global markets it has relied on are expected to be weaker in the future. The existing pattern of growth is energy- and natural-resource intensive and environmentally unsustainable. The constrained supply of major mineral resources and environmental degradation limit the country's ability to maintain its past level of economic growth.

Even though the Government declared the country to be a "social market economic state" more than a decade ago, some sectors remain under Government control, including electricity, gasoline, and coal. The Government projects that, by yearend 2015, the country will have to reduce its energy consumption and carbon dioxide emissions by 16% and 17%, respectively; nitric oxide, by 10%; and sulfur dioxide, by 8% from the levels of 2010. The Government has also indicated that it intends to support and build a more energy-efficient and ecologically friendly society. Its plan to reduce carbon emissions is to be focused on the energy-intensive sectors, such as cement, chemicals, iron and steel, and nonferrous metals. The

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Government issued a series of technological and fiscal support policies in 2010 to promote the use of renewable energy. The Government stated that the country's economic growth should be less dependent on export markets in the United States and Europe and thus plans to transform the economy from one that is export focused to one that is consumer driven. The Government also indicated its intent to develop the right talent domestically rather than hire talent from other countries (State Council, The, 2011a, p. 1–5; 2011b; 2012b, p. 1–7).

Small- and medium-sized enterprises, which were largely owned by the private sector, were playing an increasingly important role in the Chinese economy. These enterprises accounted for about 60% of the country's GDP and more than 50% of the Government's tax revenue. They also provided about 80% of employment in urban areas. In 2010, the Government announced that it would offer wider market access to the private sector; however, private enterprises continued to face numerous difficulties, such as heavy tax burdens, difficulty in obtaining bank loans and a scarcity of skilled labor. Private enterprises also faced access obstacles to monopolized sectors, such as the oil and gas, power, and railway sectors. The Government planned to allow the private sector to invest in education, energy, finance, health care, and municipal construction in the next several years. The Government would set up small- and medium-sized development funds to help with the financial issues. It also planned to replace business taxes on certain services with a nationwide value-added tax following a pilot program that had already been introduced in Beijing City, the Provinces of Jiangsu and Zhejiang, and the Pearl River Delta (Citigroup Global Market Inc., 2012b).

The Central Committee of the Communist Party of China met in October and issued a policy guideline (the 12th 5-year plan) for the economic development of the country during the next 5 years (2011 through 2015). The Committee set goals for the country to achieve sustained rapid growth and development in a way that is more people oriented and causes less degradation of the environment.

The Ministry of Industry and Information Technology (MIIT) subsequently issued the 12th 5-year development plans for individual sectors of the economy. In the 12th 5-year development plan for the iron and steel sector, the Government described the development of the iron and steel sector as having taken place mainly in the northern part of the country. In coastal areas, especially in the southeastern part of the country, iron and steel production was lagging behind demand; however, in the Bohai area, iron and steel production exceeded demand. To balance this trend, the Government decided not to approve any new iron and steel construction projects in the Bohai area (which includes the cities of Beijing and Tianjin and the Provinces of Hebei, Shandong, and Liaoning) and the Yangtze Delta (Shanghai City and the Provinces of Jiangsu and Zhejiang). Iron and steel production in the Pearl Delta would increase to meet regional demand. In the western part of the country, the Government planned to expand iron and steel production based on the market conditions, such as the availability of energy and iron ore resources in Xinjiang Autonomous Region and Yunnan Province. The Government estimated that the country would consume between 770 million metric tons per year (Mt/yr) and 820 Mt/yr of steel between 2015 and 2020. It encouraged iron and steel enterprises to invest in chromite, coke, iron ore, and manganese projects in other countries to secure supplies of raw materials. In 2011, China was required to import more than 60% of the iron ore needed to meet domestic demand. Steel enterprises were encouraged to invest more funds on research and development of high-value-added steel products. At yearend 2015, the country would retire all 400-cubic-meter blast furnaces and 30-metric-ton (t) converters and electric arc furnaces. The energy consumption of each ton of steel output would be reduced to 580 kilograms (kg) of standard coal [5,500-kilocalorie (kcal) coal], and the emission of sulfur dioxide would be reduced to about 1 kg (Ministry of Industry and Information Technology, 2011c).

In the 12th 5-year development plan for the nonferrous metals sector issued by the MIIT, the Government estimated that the annual rate of increase in consumption for 10 mineral commodities (aluminum, antimony, copper, lead, magnesium, mercury, nickel, tin, titanium, and zinc) would be about 7.5% between 2011 and 2015 compared with about 15.5% between 2005 and 2010. The apparent consumption of each commodity in 2015 would be as follows (in order of the tonnage of consumption): copper, 24 million metric tons (Mt); aluminum, 9.7 Mt; zinc, 7.2 Mt; lead, 6.2 Mt; magnesium, 750,000 t; nickel, 700,000 t; tin, 191,000 t; titanium, 150,000 t; antimony, 110,000 t; and mercury, 18,000 t. The top 10 aluminum and copper producers would produce 90% of the country's total output, and the top 10 lead and zinc producers would account for 60% of the total. The Government would strictly control the utilization of raw materials and energy and would enforce environmental protection regulations. The development of new projects and the retirement of output capacity of each commodity were expected to be balanced. The aluminum and magnesium producers would gradually relocate to the western part of the country where energy resources are rich. China depended on imported copper and nickel raw materials for metal production so the Government encouraged producers to relocate their plants to the coastal areas. Secondary metal producers of such commodities as aluminum and copper also were encouraged to establish production bases in the coastal areas. The Government encouraged nonferrous metal producers to explore for nonferrous metals and to build alumina and aluminum plants, copper plants, lead and zinc smelters, and nickel plants in foreign countries. The Government would strictly control the dispersion of heavy metals into the environment and nonferrous metal producers will be required to install recycling systems to recover all heavy metals. All obsolete production technology would be abandoned (Ministry of Industry and Information Technology, 2011d, p. 2–22).

The MIIT also issued the 12th 5-year development plan for construction materials. The Government estimated that the consumption of limestone by the cement sector would be 2.3 billion metric tons (Gt); silica for the glass sector, 30 Mt; magnesite, 16 Mt; bentonite, 4.5 Mt; kaolin, 3.8 Mt; talc, 2.2 Mt; and graphite (flake), 950,000 t in 2015. China was expected to increase cement consumption to 2.2 Gt in 2015 from 1.9 Gt in 2010. The Government expected that cement output from the dry kiln process would increase to 81% of total cement

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production in 2015 because about 250 Mt of obsolete production capacity would be eliminated during the next 5 years. The top 10 cement producers would account for 35% of the country's cement production in 2015 compared with 25% in 2010. About 50% of cement output would be high-grade Portland cement. The Government would strictly control the expansion of cement output capacity in the country, especially in coastal Provinces. China would devote strong efforts to reducing carbon dioxide emissions by the use of cement exhaust gas in low-temperature waste-heat power generation. Furthermore, the country would utilize more industrial waste instead of clinker in cement production to reduce energy consumption and gas emissions to the environment during the production of clinker (Ministry of Industry and Information Technology, 2011a, b).

In 2011, the Ministry of Finance (MOF) issued temporary resource tax regulations. The guidelines specified the rate of tax for each mineral commodity and the classification of each commodity. Natural gas and oil were taxed at 5% of the market price. Coking coal was 8 yuan per metric ton, but other kinds of coal were taxed based on the location, ranging from 2.5 yuan per metric ton in Beijing City to 4 yuan per metric ton in Henan Province. Industrial minerals were taxed between 2 yuan per metric ton and 20 yuan per metric ton. Iron ore was classified into six categories, and the tax range was between 10 yuan per metric ton and 25 yuan per metric ton. Nonferrous metals were classified into five categories and the tax range was between 0.6 yuan per metric ton and 20 yuan per metric ton. Vein and placer gold were taxed differently. Bastnasite and monazite were each taxed at a rate of 60 yuan per metric ton; middle and heavy rare earths were taxed at a rate of 30 yuan per metric ton. The new tax rates took effect on November 1, 2011, and the Government considered readjusting the resource tax further in 2012. Local governments were authorized to determine resource taxes on mines that were not listed in the guidelines; however, the resource taxes on these mines must be within 30% of that for neighboring mines that are listed in the MOF guidelines (Ministry of Finance, 2011; Zhonghua Renmin Gongheguo Guowuyuan Gongbao, 2011a).

The Government amended the personal income tax regulation, which was issued in 1994. The standard monthly deduction for employment income increased to 3,500 yuan from 2,000 yuan; the tax rate for the lowest bracket was reduced to 3% from 5% and that for the highest bracket remained at 45%, but the monthly taxable income was reduced to 80,000 yuan from 100,000 yuan. The new regulation gave tax relief to low- and medium-income earners and imposed a higher tax on high-income earners. The change aimed to address the income disparity. The new tax rate took effect on September 1, 2011 (Zhonghua Renmin Gongheguo Guowuyuan Gongbao, 2011b).

The State Council issued a strategic new industrial policy to accelerate the development of the next generation of information technology, to promote research and development in biomedical engineering fields, to implement projects for saving energy and for environmental protection, and to develop new applications for high-performance fiber, composite, rare-earth, and nano materials for the aeronautics and astronautics industries. The Government planned to utilize natural resources in the central and western parts of the country and to consolidate small companies in the east (China Chemical Reporter, 2012a; State Council, The, 2012c, p. 1–7).

The Ministry of Commence (MOC) and the National Development and Reform Commission (NDRC) jointly issued a new policy on foreign investment in China. Effective on January 30, 2012, the Government mandates that investment by foreign investors who participate in the prospecting and exploration for iron ore and manganese and in the prospecting for, exploration for, and exploitation of coalbed methane, natural gas, and oil, must be done through Sino-foreign joint ventures. It further encourages foreign investors to use high technology in the production of nano-alumina and aluminum nitride powder, high-purity silicon carbide, silicon nitride, zirconium oxide powder, rutile powder, and high-purity barium titanate. The Government restricts foreign investor participation in the exploration and exploitation of barite (in joint ventures only), gold, platinum-group metals, and silver, high-alumina clay, graphite, phosphate rock, lithium, and pyrite. Smelting and refining of antimony, aluminum, copper, lead, molybdenum, tin, tungsten, and zinc are also restricted. The Government allows foreign investors to participate in rare-earth separation and smelting (in joint ventures only). The Government bans foreign investors from participating in the exploitation of antimony, fluorspar, molybdenum, rare earths, tin, tungsten, and radioactive materials. The Ministry of Land and Resources issued interim regulations on surveying and mapping by foreign organizations in China (Ministry of Commerce, 2011e, various pages; Ministry of Land and Resources, 2011).

Production

China was one of the world's leading producers of aluminum, antimony, barite, bismuth, cement, coal, copper, fluorspar, gold, graphite, indium, iron and steel, lead, lime, magnesium, manganese, molybdenum, phosphate rock, rare earths, salt, silver, talc, tin, tungsten, and zinc. The country's output quantities of these mineral commodities were sufficient to have a significant effect on world markets. In 2011, China's production of such commodities as alumina, aluminum, bauxite, bismuth, cement, coal, copper, gold, graphite, iron and steel, lead, mercury, phosphate rock, silver, tin, titanium, tungsten, and zinc increased compared with that of 2010 (table 1).

China's reform priorities were to improve the efficiency of resource allocation and to boost economic growth. The Government understood that the unbalanced growth of consumption, investment, and net exports could not continue unabated forever. During the past several years, the Government reduced the export tax rebates on ferrous and nonferrous metal products, increased the export duties on energy-intensive metals, and encouraged producers to produce high-value-added products. Owing to increasing domestic and overseas demand, China's minerals and metals output was expected to continue to increase.

Structure of the Mineral Industry

China's mining industry is highly fragmented and has had a poor safety record. Several companies often mined in a single mining area. As a result, miners searched for

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resources and ignored laws and regulations regarding safety and the environment. The State Council approved a mining consolidation plan that had been proposed jointly by the Ministry Land and Resources (MLR), the NDRC, and other agencies. Fifteen mineral commodities—antimony, bauxite, coal, copper, gold, iron ore, lead, manganese, molybdenum, phosphorus, potassium, rare earths, tin, tungsten, and zinc—were on the consolidation plan. The Central Government worked with local governments to implement the plan. Small mine operators were targeted to be integrated into large operators through such means as acquisition or joint-management agreements. The State-Owned Assets Supervision and Administration Commission would transfer state-owned assets of these small operators to the large operators. The Government would not allow any expansion of mining boundaries during the consolidation period. The Government would not issue mining operation permits to uncooperative mine operators. Local governments were required to submit their consolidation plans to the MLR for recording. During the past several years, the Government enabled state-owned enterprises to diversify their core business into other sectors, such as by allowing Aluminum Corporation of China (Chinalco) to be a major shareholder of copper companies in the Provinces of Hebei and Yunnan and rare-earth companies in Jiangsu Province and Guangxi Zhuangzu Autonomous Region. Baoshan Iron and Steel (Group) Corp. invested in coal mining in Shanxi Province, and Jiangxi Copper Co. Ltd. took charge of consolidation of rare-earth mining activities in Sichuan Province. Minmetal Group Co. took charge of consolidation of the Hunan Nonferrous Metal Co. and invested in rare-earth separation plants in Jiangxi Province.

Mineral Trade

China had become one of the most important production and consumption centers in the world. According to customs statistics, China's total trade was valued at $3.64 trillion in 2011, which was an increase of 22.5% compared with that of 2010. The value of exports increased by 20.3% to $1.90 trillion. The European Union (EU) was the leading destination for China's exports followed by the United States, Hong Kong, and Japan. The value of China's imports increased by 24.9% to $1.74 trillion. The EU was China's leading source of imports followed by Japan, the Republic of Korea, and the United States. Imports of raw materials, such as bauxite, chromium ore, iron ore, manganese ore, potassium fertilizer, and oil, increased sharply. In 2011, the total value of mineral and metal product trade was $251.7 billion. China's main exports were low-end and semimanufactured goods. Large amounts of capital, technologies, designs, and even raw materials were coming from abroad. Consequently, China posted a trade surplus with countries that consumed manufactured goods, such as the United States and the countries of the European Union, and trade deficits with such countries as Australia, Brazil, Chile, and Indonesia, which produced and exported fuels and minerals (General Administration of Customs of the People's Republic of China, 2012; Ministry of Land and Resources, 2012, p. 13).

The MOC issued circular No. 98, which details the mineral commodities that are under the Government's monitoring list for export. The commodities are ammonium paratungstate; bauxite and refractory clay; coal; coke; concentrates of antimony, cobalt, gold, molybdenum, silver, tin, tungsten, and zinc; dolomite; fluorspar; magnesite; oxides of antimony, magnesium, and tungsten; rare earths; silicon carbide; silver; talc; and unwrought metal and alloys of antimony, beryllium, bismuth, copper, gallium, germanium, nickel, niobium, platinum-group metals, tantalum, tin, and zirconium. Of these exported mineral commodities, antimony and its products, coal, petroleum and its products, silver, and tungsten and its products were under state management. In 2011, the Government encouraged the import of raw materials, such as concentrates of chromite, nickel, niobium, tantalum, titanium, and uranium; antimony concentrates with metal content higher than 30%; copper concentrates with metal content higher than 20%; cobalt concentrates with cobalt content higher than 6%; lead concentrates with lead content higher than 55%; molybdenum concentrates with metal content higher than 51%; zinc concentrates with zinc content higher than 40%; and ferronickel. Beginning on January 1, 2012, the tariff rate on imports of rare-earth compounds was reduced to zero from 5.5%. The MOF announced that the export tariff rates would be changed, including those for many minerals and metals (Ministry of Commerce, 2011b, p. 1–20; Ministry of Finance, 2012, various pages).

China was either the world's leading or one of the world's top three producers of high-alumina clay, antimony, fluorspar, molybdenum, rare earths, tin, and tungsten. The Government indicated that these commodities had been over-exploited during the past several decades, which threatened to deplete these resources. Therefore, the Government decided to regulate the production of these commodities. The MOC also issued guidelines for enterprises that had the right to supply and export antimony, coke, ferroalloys, indium, molybdenum, rare earths, silver, and tungsten. During the past 3 years (2008 to 2010), producers that could produce annually more than 10,000 t of refined antimony or 8,000 t of antimony oxide, 12 t of indium, 6,000 t of molybdenum concentrates (greater than 51% molybdenum content) or ferromolybdenum (greater than 55% molybdenum), or 3,000 t of ammonium paratungstate (equivalent), met the Government requirements. Also, producers must be registered and meet environmental protection regulations for their operations (Ministry of Commerce, 2011a, d).

The Government adjusted the 2012 export quota for magnesia to 1.8 Mt, phosphate rock to 1.2 Mt, bauxite (alumina clay) to 700,000 t, talc to 680,000 t, silicon carbide to 216,000 t, antimony and antimony products (metal content) to 59,400 t, molybdenum to 25,000 t, tin and tin products (metal content) to 18,000 t, tungsten and tungsten products (metal content) to 15,400 t, silver to 5,387 t, and indium to 231 t. The 2012 export quotas for antimony, magnesia, silver, talc, tungsten, and tin decreased compared with those of 2011. The first batch of export quotas for mineral products usually accounted for 60% of the total annual export quota. Analysts predicted that exports of rare metals would decrease gradually at a rate of 2% to 3% per year in the future. A planned reduction of the value-added tax rebate and reduced export quota on energy-intensive products would force producers to reduce their output; this would help to protect and conserve mineral resources and minimize environmental

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damage. Although the export quotas for coal, coking coal, and rare earths were not publicly available, the announcement of the changes in the export allocations and an increase in tariffs for those commodities indicate that the export volumes of the commodities would likely be at the same level in 2012 as those of 2011 (Ministry of Commerce, 2011c).

The MOC also announced a first-batch rare-earth export quota of 24,904 t for 2012. The Government specified how much light or middle and heavy rare earths that each company was allocated. This policy was different than in previous years, when the Government had assigned export quotas without specification. The Government withheld export quotas for companies that did not meet the environmental protection guidelines. Of 27 companies and traders, only 9 were cleared to export rare-earth products immediately, and the total rare-earth export volume was 10,546 t. The Government intended to reassign the failing companies' export quotas to other companies if they did not pass the environmental protection guidelines by July 2012 (Ministry of Commerce, 2011f).

In 2009, the EU, Mexico, and the United States requested that the World Trade Organization (WTO) schedule dispute-settlement consultations regarding China's export restraints in the form of export quotas on bauxite, coke, fluorspar, magnesium, manganese, silicon carbide, silicon metal, yellow phosphorus, and zinc. China had imposed additional requirements and procedures in connection with these materials, including restricting the right to export based on previous companies' export information; establishing criteria that foreign-invested enterprises must satisfy in order to export that were different from those that domestic enterprises must satisfy; and requiring exporters to pay fees. The parties maintained that the restraints were significant enough to distort the international market and provide preferential conditions for Chinese industries that used these materials. The Chinese Government's position was that these policies were to protect the environment and natural resources. Consultations are the first step in the resolution of a WTO dispute. A WTO dispute settlement panel was established in 2010 to examine the dispute. The panel ruled that China's restriction on exporting these raw materials was inconsistent with its obligations when the country was admitted to the WTO. Also, that the Chinese Government had not imposed restrictions on production and consumption of these materials in the country. China appealed the panel's decision but the WTO's appellate body upheld the panel's decision that China's export restrictions on these raw materials were inconsistent with its obligations (World Trade Organization, 2011, p. 263–271; 2012, p. 94–123).

Commodity Review

Metals

Aluminum.—China's aluminum production continued to increase in 2011. The aluminum price in China resembled the London Metal Exchange price in 2011. The domestic market price of aluminum reached 17,849 yuan ($2,833) per metric ton in August 2011 and decreased to about 16,002 yuan ($2,540) per metric ton at yearend. The average market price of aluminum for the year was 16,870 yuan ($2,678) per metric ton. In 2011, China remained a net importer of aluminum. The net trade volume of unwrought aluminum increased to 143,172 t in 2011 from 36,322 t in 2010 but was still less than the 1.44 Mt traded in 2009. Unwrought aluminum imports increased during the first 4 months of 2011, even though the country's aluminum smelters, which were located in the Provinces of Guangxi, Henan, Hunan, and Sichuan, had not restarted their operations and several greenfield aluminum smelters in the western part of the country delayed putting their smelters into operation. Also, many aluminum producers reduced their output to cut losses as prices of aluminum declined. About 630,000 t of capacity had been idled in December 2011. China was a net exporter of 576,171 t of unwrought aluminum alloy compared with 332,680 t in 2010. China's unwrought aluminum imports came mainly from Russia, Oman, Australia, South Africa, India, and North Korea (in descending order of volume), and the country's exports went to the Republic of Korea and Japan (in descending order of volume). China consumed about 18.5 Mt of aluminum in 2011. The Government ordered aluminum producers to eliminate prebaked cells that were 100-kiloamperes or smaller (about 618,600 t of production capacity). About 4 Mt of new capacity was installed in 2011. As a result, the country's aluminum output capacity reached 26 Mt/yr at yearend 2011 compared with 22 Mt/yr in 2010. The construction sector was the leading consumer of aluminum and accounted for about 39% of the total followed by transportation, 18%; electronics, 9%; machinery and household appliances, 8% each; packaging, 7%; and others, 11% (Alumina and Aluminum Monthly, 2012a; China Metals, 2012f; Recycling Resources, 2012).

China's bauxite deposits were more than 90% of the diaspore (natural hydrous aluminum oxide) type; the remaining 10% was of the gibbsite (monoclinic aluminum hydroxide) type. There were more than 400 known bauxite occurrences in China for a total resource of about 2 Gt, of which more than 700 Mt was reserves. The Provinces of Guizhou, Henan, and Shanxi and the Autonomous Region of Guangxi together accounted for about 93% of the total reserves. Most of the diaspore ore contained between 45% and 65% alumina, 4% and 14% silicon oxide, and 5% and 25% iron oxide. China followed Australia as the second ranked bauxite-producing country in the world. Owing to the expansion of alumina production during the past 10 years, the country required extensive imports of bauxite to meet the demand from its alumina refineries. Refineries in the coastal Province of Shandong relied on overseas bauxite for their alumina production. China's bauxite imports were 44.8 Mt in 2011 compared with 30.0 Mt in 2010. In 2011, bauxite imports from Indonesia and Australia accounted for 79.7% and 18.8%, respectively, of the total. The trend toward increased bauxite imports was expected to continue in the future. The Government of Indonesia announced that it would restrict raw material exports, which would affect Shandong's alumina refineries in the future because these refineries produced alumina solely from imported bauxite. The Government encouraged enterprises to explore for bauxite resources in African countries and in Australia (Alumina and Aluminum Monthly, 2012b; China Metal Bulletin, 2012j).

China's output of alumina increased by more than 17% in 2011 compared with that of 2010, but China continued to

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experience a shortage of alumina. To support the aluminum sector, the country imported large quantities of alumina to meet the demand. In 2011, China imported 1.9 Mt compared with 4.31 Mt in 2010, of which, about 97% was from Australia. China consumed about 38.0 t of alumina in 2011, of which 36.5 Mt was for metallurgical use and 1.5 Mt was for nonmetallurgical use. The shortage of supply of alumina was met from stockpiles. By yearend 2011, more than 10 Mt/yr of alumina output capacity was installed, and the country's alumina output capacity reached 51 Mt/yr. The additional alumina capacity was from greenfield and brownfield projects, including Shandong Weiqiao Aluminum Co. (2 Mt/yr), Shanxi Xing'an Chemical Co. (1.5 Mt/yr), Chalco Zunyi Alumina Co. Ltd. (800,000 t/yr), Chalco Chongqing Co. (800,000 t/yr), Guangxi Xinfa Aluminum and Power Co. Ltd. (800,000 t/yr), Guizhou Galuminum Group Co. Ltd. (800,000 t/yr), Yunnan Aluminum Co. Ltd. (800,000 t/yr), Shanxi Luneng Jinbei Aluminum Co. Ltd. [500,000 metric tons per year (t/yr)], Guangxi Huayin Aluminum Co. Ltd. (400,000 t/yr), Longkou Donghai Alumina Co. Ltd. (400,000 t/yr), Sanmenxia Yixiang Aluminum Co. Ltd. (400,000 t/yr), and Nei Mongol Mongxi Group Co. (200,000 t/yr). Imports of alumina were expected to decrease in the future (Alumina and Aluminum Monthly, 2012a).

According to the MIIT-issued 12th 5-year development plan for the aluminum sector, the country was expected to produce 24 Mt of primary aluminum, and the top 10 smelters would account for 90% of the total output in 2015. Secondary aluminum output would reach 5.8 Mt. About 800,000 t of output capacity would be phased out during that period. Electricity consumption per metric ton of primary aluminum production would be controlled below 12,000 kilowatthours (kWh) in 2015 from 13,084 kWh in 2010. The MIIT urged aluminum enterprises to develop high-value-added aluminum products that could be applied to new strategic industry sectors. China planned to increase its alumina output capacity by 8 Mt/yr by 2015. The increase in alumina output capacity would likely be from the Provinces of Guizhou, Guangxi, and Shanxi where bauxite resources are located. The development of the ability to use red mud and coal containing a high percentage of alumina would be important for the environmental health (Ministry of Industry and Information Technology, 2011e).

Copper.—Because it has limited copper resources, China imported a considerable amount of copper concentrates, scrap anode, and refined metal from overseas markets. Domestic copper mines supplied less than 30% of the country's requirements for copper concentrates. In 2011, China imported 6.38 Mt of copper concentrates, which was 1.43% less than in 2010. Copper concentrates were imported from Chile (22.2%), Peru (15.9%), Australia (9.1%), Mongolia (8.0%), Mexico (7.2%), Canada (4.6%), the United States (4.3%), and others (28.7%). China imported 4.69 Mt of copper scrap from the United States (13.8%), Spain (9.1%), Australia (7.4%), Germany (6.4%), Malaysia (5.2%), the Netherlands (4.6%), France (4.0%), Japan (3.5%), and others (46.0 %); and 2.80 Mt of refined copper from Chile (45.0%), India (8.5%), Japan (6.9%), Kazakhstan (6.0%), Australia (5.1%), Zambia (4.7%), and others (23.8%). In 2011, imports of copper scrap increased by 7.4% compared with those of 2010; however, imports of refined copper decreased by 4.1% owing to a surplus of refined copper in the domestic markets in the first half of 2011. The price of refined copper in the international market decreased to $7,500 per metric ton at yearend from more than $9,000 per metric ton in January 2011, which was lower than the price on the domestic market. If the import tax is included, the price of imported refined copper was less than that of domestic refined copper; therefore, domestic traders imported refined copper during the last quarter of 2011. In 2011, the apparent consumption of refined copper was about 8.0 Mt; however, domestic analysts estimated that the producers and traders stockpiled about 700,000 t of copper in their warehouses and that real copper consumption was about 7.3 Mt, which was about 7.8% higher than that of 2010. The power sector was the leading consumer of copper and accounted for about 46% of the total followed by household appliances, 15%; transportation 11%; electronics, 8%; and others, 20% (China Metals, 2012c; Copper Monthly, 2012).

Owing to domestic smelter and refinery expansions, China's copper output increased sharply during the past several years. China's copper production continued to expand despite the constrained supply of copper concentrates on the world market. In 2011, China's copper smelting and refining output capacities increased by 600,000 t and 1 Mt, respectively, and reached 3.9 Mt/yr and 6.5 Mt/yr, respectively, and the capacities were expected to increase to 5.5 Mt/yr and 8.0 Mt/yr, respectively, in 2015. The output of domestic mined copper was expected to increase to about 1.3 Mt/yr in 2015. According to China Nonferrous Metals Industry Association, the country's average ore grade was 0.77% copper. Owing to lower ore grade and more complicated elemental composition in the ore, the processing recovery rate decreased to 86.58% (China Metal Bulletin, 2012d).

The MIIT published a list of obsolete production technologies and ordered producers to close down those production plants in 2011. A total of 24 copper plants (with a combined output capacity of 425,300 t/yr) that used small reverberatory or electric furnaces were included on the list. During the same period, several greenfield and brownfield copper projects were under construction. Guangxi Nanguo Co. Ltd. (a subsidiary of Southern Nonferrous Smelting Ltd.) planned to invest $570 billion to build a 150,000-t/yr copper smelter at Chongzuo in Guangxi Province. The Government had approved the environmental impact study for the greenfield smelter. Shandong Zhaojin Mining Co. Ltd., which was a gold producer in Shandong Province, invested $160 million to build a copper plant in Jiashi, Xinjiang Uygur Autonomous Region. The plant was designed to produce 90,000 t/yr of blister copper, 100,000 t/yr of refined copper, 50 t/yr of silver, and 1 t/yr of gold. The copper plant was under the management of Xinjiang Xinhui Co. Ltd. and was scheduled to be completed in 2013. After completion, Xinjiang Xinhui would have a total blister copper output capacity of 100,000 t/yr. Copper concentrates were from local miners in Jiashi (China Metals, 2011a, b).

Guangxi Jinchuan Metals Co. Ltd., which was a subsidiary of Jinchuan Nonferrous Metals Group in Gansu Province, planned to invest $480 million to build a copper plant in Fangchenggang, Guangxi Zhuangzu Autonomous Region.

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The plant was designed to produce 400,000 t/yr of primary copper and 200,000 t/yr of secondary copper. In addition to the copper plant, the company also planned to build a 400,000-t/yr ferronickel plant and an 80,000-t/yr nickel plant as well as downstream copper and nickel products. Yunnan Tin Corp. planned to put its 50,000-t/yr copper smelter into trial operation in 2012 and to expand to the smelter output capacity to 100,000 t/yr in 2013. Part of the copper concentrates were from its own mines, which had a capacity to produce 20,000 t/yr of copper in concentrates. Hong Kong-registered Xikuang Holdings Ltd. and the government of Ruichang City of Jiangxi Province reached an agreement to build a 150,000-t/yr copper smelter and a 20,000-t/yr copper foil plant in Ruichang (China Metals, 2012a, b, h).

CNMC Fubang Copper Industry Co. Ltd. completed the construction of its 100,000-t/yr copper blister plant in Linxi County, Nei Mongol Autonomous Region. The blister copper would be shipped to its 60,000-t/yr copper refinery to be refined. Sichuan Hongda Co. Ltd. announced that the company would invest $1.6 billion to build a multimetal complex at Shifang Economic Development Zone in Shifang City, Sichuan Province. The complex would hold a 400,000-t/yr refined copper plant and a 40,000-t/yr molybdenum plant. In the first phase of construction, a 200,000-t/yr refined copper plant, 25,000-t/yr ferromolybdenum plant, and 7,500-t/yr molybdenum oxide plant would be built. The Ministry of Environmental Protection approved the environmental impact study. Shandong Dongying Fangyuan Nonferrous Metals Co. Ltd. was scheduled to complete its second 200,000-t/yr copper refinery in 2012. Fangyuan's refined copper capacity would increase to 400,000 t/yr (China Metal Bulletin, 2011c; Copper Monthly, 2011).

Iron Ore and Iron and Steel.—China was the world's leading iron and steel producer, accounting for more than 57% of the world's pig iron production and 45% of the world's crude steel production in 2011. The country's iron and steel sector continued expanding its output in 2011. Production of pig iron and crude steel increased by more than 7% each in 2011 compared with production in 2010. The rate of growth was the slowest of the past several years owing to weak demand for steel products in both the domestic and international markets. In 2011, the total fixed-asset investment in the iron and steel sector was $81.1 billion, which was an increase of 15.5% from that of 2010; of that amount of investment, iron ore mining and processing accounted for 24.5% of the total. The ironmaking and steelmaking output capacity increased to 700 Mt and 850 Mt, respectively, in 2011. The Provinces of Hebei, Jiangsu, and Liaoning ranked as the top three Provinces in fixed-asset investment in the country. Other Provinces and cities, such as Chongqing, Henan, Hunan, and Shandong, also increased investments in the iron and steel sector. Private funds accounted for about 80% of the investment. Apparent consumption of crude steel was 650 Mt, which was 8.0% higher than that of 2010. In 2011, China exported 48.9 Mt of steel products, which was an increase of 14.8% from that of 2010, and imported 15.7 Mt of steel products, which was a decrease of 5.0% from that of 2010. China was a net exporter of 33.2 Mt of steel products. This indicated that more than 50% of the increase in crude steel output was targeted for exported steel products. Exports of China's steel products to Asian countries accounted for 55% of the total exports. Steel products imports from Japan, the Republic of Korea, Taiwan, and the European Union (in descending order of value) accounted for 90% of the total imports (China Metal Bulletin, 2012a; China Metals, 2012d; Hu, 2012).

During the past several years, the country's iron ore production increased sharply; however, the percentage of iron ore (iron content) supplied by domestic producers remained at less than 50% of the demand in 2011, and China continued to depend on iron ore imports to fill the gap. Also, owing to the low iron content and high impurities of domestic ore, pig iron producers preferred imported ore over domestic ore. Imports of iron ore increased to more than 686 Mt in 2011 from 618 Mt in 2010. Australia, Brazil, India, South Africa, and Canada, in descending order of amount imported, were China's key iron ore suppliers. The total amount of iron ore stockpiled at China's 25 major ports was more than 98 Mt at yearend 2011. About 50% of seaborne ore in the world was destined for China.

China's iron and steel producers and the three leading iron ore producers in the world—BHP Billiton Ltd. of Australia, Rio Tinto Ltd. of Australia, and Vale S.A. of Brazil—could not reach contract agreements in 2009. These three international iron ore producers scrapped the annual iron ore pricing system and replaced it with a quarterly pricing system based on the combination of the Steel Index, the Metal Bulletin iron ore indexes, and the Platts iron ore spot market assessment to determine the iron ore price. The data were collected from iron ore traders. Owing to China's increased demand for iron ore, the price (cost, insurance, and freight) of iron ore increased to $163.84 per metric ton in 2011 from $128.99 per metric ton in 2010. As a result, the price of iron ore became more volatile during the year. China's Beijing Custeel E-Commerce Co. Ltd. launched an iron ore spot index in Beijing. The index would be based on imported and domestic iron ore transaction prices. Domestic iron ore price statistics were collected from 33 locations in 15 Provinces. BHP Billiton, Rio Tinto, and Vale joined the China Beijing Metal Exchange (China Metals, 2012g; Rio Tinto Ltd., 2012).

After more than 5 years, the NDRC finally gave permission for Baoshan Iron and Steel Group and Wuhan Iron and Steel Group to build two iron and steel complexes in Guangdong Province and Guangxi Zhunagzu Autonomous Region, respectively. Baoshan would invest about $11 billion in the iron and steel project in Zhanjiang, Guangdong. At its designed capacity, the plant would produce 9.2 Mt of pig iron, 10 Mt of crude steel, and 9.4 Mt of steel products. Wuhan would also invest about $11 billion in the iron and steel project at Fangchenggang, Guangxi. That plant would have a designed capacity to produce 8.5 Mt of pig iron, 9.2 Mt of crude steel, and 8.6 Mt of steel products. Currently, China imported about 70% of high-value-added steel products from overseas. Baoshan planned to produce high-value-added steel products at its Zhanjiang plant to meet domestic customers' demand. Wuhan planned to have its steel products target manufacturing bases of automobiles and home appliances in the southern part of the country and in the countries of Southeast Asia (China Metals, 2012e).

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Molybdenum.—China's mined molybdenum output ranked it among the top three producers in the world. China's molybdenum resources were concentrated in the Provinces of Hunan and Shaanxi and in the Nei Mongol Autonomous Region. The Luanchuan area in Henan Province, the Huludao area in Liaoning Province, and the Jinducheng area in Shaanxi Province were China's major molybdenum bases. In 2011, Henan was the leading molybdenum producing Province and accounted for 33% of total molybdenum output; it was followed by Shaanxi, 20%; Nei Mongol, 16%, Liaoning, 8%; and others, 23%. China was a net exporting country of 2,239 t of molybdenum concentrates in 2011. Molybdenum consumption in China increased to about 70,000 t in 2011 from about 20,000 t in 2006. Molybdenum was mainly consumed by the iron and steel sector, which accounted for 78% of total consumption. During the past several years, the country discovered molybdenum deposits, such as Shapinggou in Anhui Province, Wushan Wenquan in Gansu Province, Yuanzhuding in Guangdong Province, Qianerchong in Henan Province, Wushan in Nei Mongol Autonomous Region, and Baishan and Dong Gobi in Xinjiang Uygur Autonomous Region. China's molybdenum production bases were expected to expand to the northern and southern parts of the country in the future (China Metal Bulletin, 2011e; China Nonferrous Metals, 2011a; Liu, 2011; Jiang, Liu, and Zhang, 2012).

Tin.—China was the leading tin-producing country in the world. Owing to increased domestic demand in China, Indonesia replaced China as the leading exporting country, and China became a net importer of tin concentrates. In 2011, China imported 28,791 t of tin concentrates compared with 19,840 t in 2010. Burma accounted for 71.7% of the total imports in 2011 followed by Bolivia, 14.1%; Australia, 6.0%; Laos, 2.8%, and others, 5.4%. In 2011, the volume of tin concentrates from Burma increased by about threefold compared with that of 2010. Burma's tin content in concentrates was lower than those from Australia and Bolivia because most of Burma's tin concentrates had not been processed. Domestic analysts estimated that the tin in concentrates was lower than that of 2010 even though the volume of imports increased. China's imports and exports of unwrought tin were 22,176 t and 1,226 t, respectively. Indonesia was the leading unwrought tin exporter to China and accounted for 38.6% of China's total tin imports, followed by Malaysia, 25.1%; Thailand, 12.5%; Bolivia, 10.2%; and others, 13.6%. China consumed about 155,000 t of tin in 2011 (Lead, Zinc, and Tin Monthly, 2012).

The Government raised the resource tax on tin ore to between 12 yuan and 20 yuan per metric ton depending on grade. China's ore grades were typically less than 1% tin. As a result of the increased resource tax, the production cost of domestic tin in concentrate was expected to increase by a few thousand yuan per metric ton. Prices of tin metal in China resembled those in the international markets in 2011. China's tin producers estimated that the increase in the resource tax would not affect companies' profit margins significantly provided the price of tin metal remained at above $25,000 per metric ton. Most of China's tin producers were located in Provinces of Guangxi, Hunan, and Yunnan. Most of Guangxi's tin mines and producers were located in Nandan County, Hechi City. Owing to the discovery of cadmium pollution in the river of Longjiang in late 2011, the Government ordered nonferrous metal producers in Hechi City to shut down their operations. The Government required all producers to pass an environmental impact evaluation before they would be allowed to restart their operations. As a result of the shutdowns, the supply of tin in concentrates was reduced and affected production at tin smelters in other locations of Guangxi Province in 2012 (China Metal Bulletin, 2012f).

Titanium.—In recent years, China's production of sponge titanium increased substantially and the country became one of the major titanium-producing countries in the world. During the mid-2000s, the demand for titanium increased significantly in the world, and titanium prices increased sharply during that period. Greenfield and brownfield titanium plants were being built in China. In 2011, China had more than 20 titanium sponge plants, and the total output capacity was estimated to be more than 130,000 t/yr. Most of the titanium sponge plants were located in the Provinces of Guizhou, Liaoning, and Sichuan. In China, titanium sponge was produced by the Kroll process. In the Kroll process, titanium oxide (rutile) is converted to titanium tetrachloride through the addition of chlorine gas in the presence of carbon. Titanium tetrachloride is reduced either by magnesium or sodium in an inert atmosphere to avoid contamination of the final product by air or moisture. There was a limited amount of high-quality rutile ore in China, however, and most titanium ores were associated with other elements, such as iron and vanadium. During the past several years, ilmenite was used to produce titanium slag as raw material for producing titanium sponge in China. The quality of China's titanium sponge lagged behind those from Japan and Russia. Only 70% of titanium producers could produce MHT–100 grade titanium sponge (Brinell hardness of less than 100, or mild sponge), which contains between 99.5% and 99.6% titanium. China produced a small volume of soft sponge (MHT–95 grade), which contains 99.7% titanium, and had not produced any MHT–90 grade product, which contains 99.8% titanium. About 30% of Russia's titanium sponge was MHT–90 grade (China Metal Bulletin, 2012b, i).

China's titanium oxide (titanium white) industry continued its expansion during the past several years. The production of titanium oxide increased to 1.8 Mt in 2011 from 1.0 Mt in 2007. There were 60 titanium-oxide-pigment producers with a combined output capacity of 2.3 Mt/yr in 2011 compared with 1.14 Mt/yr in 2006. In addition, about 1.7 Mt of output capacity was either under construction or in the planning stage. By yearend 2015, China's titanium-oxide pigment output capacity could reach 4 Mt/yr. China's titanium oxide was produced mainly from the sulfate process, which accounted for more than 80% of the total capacity. In China, titanium oxide was produced either from recovery from ferrotitanite ore or from ilmenite. In 2011, the country imported 2.3 Mt of titanium ore and concentrates compared with 2.0 Mt in 2010. Titanium ore and concentrates were imported mainly from Australia, India, and Vietnam. In 2012, the Government of Vietnam planned to restrict the export volume of titanium ore and concentrates, which could require China to source titanium resources from other overseas markets. Owing to the tight supply of raw

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materials in the domestic market, the price of ferrotitanite ore increased to 3,000 yuan per metric ton in June from 800 yuan per metric ton in January and titanium slag increased to 8,000 yuan per metric ton in June from 3,000 yuan per metric ton in January. As a result of an increase in production costs, anatase titanium oxide increased to 20,000 yuan per metric ton in July from 14,000 yuan per metric ton in January. The Government encouraged titanium-oxide-pigment producers to use the chlorination process instead of the sulfidation process for their new titanium oxide projects. Owing to technological problems, only about 25% of new capacity used the chlorination process (China Chemical News, 2011c; 2012c; China Chemical Reporter, 2012e).

Tungsten.—Tungsten resources were found in 23 Provinces in the country; however, the Province of Hunan and Jiangxi accounted for 80% of the total. China was the leading mined tungsten producing country in the world but was still a net tungsten concentrates importer. In 2011, China imported 9,225 t of tungsten ore and concentrates, which was an increase of 50% from that of 2010. Ores and concentrates were imported mainly from Russia, 22.1%; Canada, 20.9%; Vietnam, 18.2%; Rwanda, 12.1%; Mongolia, 10.3%, and others, 16.4%. About 5,000 t of imported tungsten concentrates was through processing trade. Owing to a shortage of raw material in the domestic market, the price of tungsten concentrates increased to an average of $22,000 per metric ton in 2011, or by 65% compared with that of 2010. In 2011, China exported 27,524 t (tungsten content) of tungsten products mainly to the EU, Japan, the Republic of Korea, and the United States. China's tungsten mining and processing capacity reached 22 Mt and 40 Mt, respectively. Many of the country's tungsten mines had reached their peak production capacity and the metal content in the ore had decreased. As a result, the production costs of these mines increased to about $16,000 per metric ton. In 2011, the country consumed about 37,000 t of tungsten compared with 36,000 t in 2010 (China Metal Bulletin, 2012l).

After more than 50 years of on and off exploration, Jiangxi geologists discovered a significant amount of scheelite resources near the depleted Dahutang tungsten mining area at Wuning County, Jiujiang City, Jiangxi Province, in 2011. The Dahutang Mine was estimated to have tungsten reserves of 3,000 t and had been mined out in the 1950s; however, recent exploration results indicated that tungsten resources in the area of the Dahutang Mine could contain 1 Mt of tungsten metal. The area also had resources of about 559,000 t of copper, 52,900 t of molybdenum, 25,000 t of tin, and 718 t of silver (China Metal Bulletin, 2011d).

Vanadium.—China's vanadium titanomagnetite resources were located mainly in Ma'anshan in Anhui Province, Chengde in Hebei Province, and Panzhihua in Sichuan Province. Vanadium resources also were found in sapropelic coal (coal stone), mainly in the Provinces of Anhui, Guizhou, Hubei, Hunan, Jiangxi, Shaanxi, and Zhejiang. Vanadium oxide (V_2O_5) content in coal ranged between 0.1% and 0.5%. Vanadium was produced mainly as a byproduct or coproduct of iron ore mining operations and in the waste stream of coal operations; therefore, reliable production data were not easily obtained. Panzhihua Iron and Steel Group Co. (Pangang) was the leading vanadium slag producer in China; it had the capacity to produce about 260,000 t/yr of vanadium slag containing about 17% vanadium oxide in Panzhihua. Pangang's iron and steel operation in Chengde also recovered vanadium from its ironmaking operation. Pangang invested $3.8 billion to mine vanadium titanomagnetite resources in the Xicheng area in Sichuan Province. The construction of the mine was completed in late 2011, and the mine had the capacity to produce 220,000 t/yr vanadium slag containing 16.8% vanadium oxide (China Metal Bulletin, 2012g).

Cayman Islands-registered and Hong Kong-listed China Vanadium Titanomagnetite Mining Co. Ltd. (a subsidiary of Chuanwei Group Co.) completed its vanadium resource utilization project at Huili County, Sichuan Province, in late 2011. The company's four processing plants had a total processing capacity of 2.6 Mt/yr of vanadium-bearing iron ore, which could produce about 100,000 t/yr of vanadium slag containing about 8,000 t of vanadium oxide (China Vanadium Titanomagnetite Mining Co. Ltd., 2012, p. 6).

The iron and steel sector was the major consumer of vanadium. The price of vanadium was correlated with the price of ferrovanadium steel products. China was estimated to have an output capacity of 110,000 t of vanadium oxide equivalent in 2011, and this output capacity was expected to increase when several mining projects in the Provinces of Gansu, Hunan, Heilongjiang, and Shaanxi were completed during the next 2 years. China was a net exporter of 8,884 t of vanadium oxide. Domestic analysts estimated that the country consumed about 48,000 t of vanadium oxide (China Metal Bulletin, 2012m; Precious and Minor Metals Monthly, 2012).

Industrial Minerals

Cement.—China was the leading cement-producing country in the world and accounted for about 50% of the world's total output. Even with the Government's restricted investment policy for the cement sector, cement output continued to increase. In 2011, cement enterprises invested a total of $22.8 billion, and the country's cement output capacity increased by 165 Mt to about 2.7 Gt. China exported 8.8 Mt of cement in 2011. The Government ordered 762 cement plants to cease their operations in 2010, and about 133 Mt of output capacity was eliminated in 2011. Since October 2009, the Government had not approved any new cement projects. China consumed about 2 Gt of cement, and the Provinces of Anhui, Guangdong, Hebei, Henan, Jiangsu, Shandong, Sichuan, and Zhejiang consumed more than 100 Mt each. The Government expected that demand for cement would decrease during the next several years because most of the stimulus projects that were started in 2008 were completed in 2011 (Ministry of Industry and Information Technology, 2012).

Graphite.—China was the leading graphite-producing country in the world. In China, graphite was mined mainly in the Provinces of Hebei, Heilongjiang, Shandong, and Shanxi and the Nei Mongol Autonomous Region. Many of the graphite producers were small- and medium-sized operations and produced low-value-added graphite products. During the past several years, owing to environmental issues, the

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Government shut down or consolidated many small miners and encouraged producers to produce high-value-added products. The Government intended to have several major graphite producers control the vast majority of supply. China's leading graphite-producing Province, Heilongjiang, formed a graphite technology alliance to develop new applications for graphite and urged the Government to shut down illegal miners to stabilize the price. Owing to the amount of electricity consumption, the Government also shut down some synthetic graphite producers in the country (Industrial Minerals, 2012).

Graphite had been widely used in brake pads, lubricants, and steelmaking refractories. During the past several years, the use of flake graphite as an anode for lithium ion batteries also became an important application. Domestic analysts predicted that consumption of graphite in the lithium ion battery sector would increase to about 200,000 t during the next several years. China was the leading exporter of graphite to the world; however, owing to increased domestic demand and the closure and consolidation of many mining facilities, natural graphite exports was expected to decrease gradually in the future (China Chemical News, 2012b).

Lithium.—China has abundant salt lakes that contain lithium, and these lakes accounted for 80% of the country's total lithium resources. Most of the lakes are located in the western part of the country, however, and infrastructure in these areas was relatively undeveloped. Spodumene resources were mainly located in the Altai and the Keketuohai areas in Xinjiang Uygur Autonomous Region and the Kangding area in Sichuan Province. Lepidolite resources were found at the Yichun area in Jiangxi Province. Brine resources were in salt lakes at the Qaidam basin in Qinghai Province and Zabuye Lake in Xizang Autonomous Region. The country's primary lithium products, which were lithium carbonate, lithium hydroxide, or lithium salt, were produced from domestic and imported raw materials. These compounds could be further processed into lithium metal or lithium cobalt oxide. In 2010, China's lithium carbonate output capacity was estimated to be about 30,000 t/yr; lithium hydroxide, 10,000 t/yr; and lithium metal, 1,500 t/yr (China Metal Bulletin, 2012e).

Sichuan Tianqi Lithium Industry Co. Ltd., which used imported spodumene to produce lithium compounds (including carbonate, chloride, and hydroxide), received Governmental approval to mine spodumene resources at Yajiang in Sichuan Province. The Cuola lithium deposit had ore resources of 20 Mt grading 1.3% lithium oxide. The company planned to design a mine to produce 1.2 Mt/yr of ore for about 20 years. The deposit also had beryllium, niobium, and tantalum. The company planned to increase its lithium carbonate and lithium hydroxide output capacity by 5,000 t/yr each, and its anhydrous lithium chloride capacity, by 1,500 t/yr in 2012 (China Metal Bulletin, 2012k).

Galaxy Resources Ltd. of Australia completed the construction of a lithium carbonate plant in the Yangtze River International Chemical Industrial Park at Zhangjiagang, Jiangsu Province, at yearend 2011. The plant was designed to have an output capacity of 17,000 t/yr of battery-grade lithium carbonate. Spodumene concentrate was from Galaxy Resources' Mount Cattlin Mine in Ravensthorpe, Western Australia, Australia. Owing to a shortage of skilled labor, the startup of the plant was delayed for several months. Galaxy signed long-term offtake agreements with 13 cathode producers in China and Mitsubishi Corp. of Japan (Galaxy Resources Ltd., 2011).

Lithium carbonate or lithium hydroxide was the precursor for producing lithium metal and other lithium chemical compounds. The demand for lithium carbonate, especially in the battery sector, increased significantly during the past several years. China's production of lithium carbonate increased to an estimated 23,000 t in 2010 from 18,000 t in 2007. Lithium-ion batteries have the features of high voltage, high energy density, a good charge rate, and stability. There are several types of lithium-ion batteries, namely lithium iron phosphate, lithium manganese oxide, lithium nickel manganese cobalt oxide, lithium cobalt oxide, lithium nickel cobalt aluminum oxide, and lithium titanate. During the past several years, the annual production of electric bicycles increased to about 30 million units from 1.6 million units in 2002. About 2.5% of these units used lithium-ion batteries, whereas others were equipped with lead-acid batteries. The Government encouraged the development of lithium-ion batteries to replace lead-acid batteries in most of electric bicycles to reduce pollution. Novolyte Technologies Inc. invested $25 million to build a 400-t/yr lithium hexafluorophosphate plant at the Nantong Development Zone in Jiangsu Province to be used for production of electric vehicle batteries. Most lithium-ion battery producers were located in Jiangsu Province (China Chemical News, 2011a, b; China Chemical Reporter, 2012d).

Phosphate Rock.—China was one of the world's leading phosphate-rock-producing countries. The country's phosphorus resources were located mainly in the Provinces of Guizhou, Hubei, Sichuan, and Yunnan. Phosphate rock was a strategic mineral; the Government controlled the volume of exports and planned not to approve any phosphate fertilizer plants during the next several years. In 2011, the Government increased its tariff rate on fertilizers and shortened the offseason period benchmark prices of ammonium phosphate. As a result, the volume of monoammonium phosphate exports was reduced to 864,800 t in 2011 from 935,000 in 2010 (China Chemical News, 2012a).

The MIIT issued the 12th five-year plan for the chemical industry and urged local governments to reduce the number of phosphate rock mining companies. The Government also planned to shut down those producers that had an output capacity of less than 150,000 t/yr. Phosphate rock mining enterprises were encouraged to recover valuable commodities, such as fluoride, iodine, magnesium, and silicon, from their tailings. Enterprises were encouraged to produce high-end products, such as organic phosphine, polyphosphate, flame retardants, and water treatment chemicals, for which the country relied on imports to meet its demand (China Chemical News, 2011d).

Potash.—China has limited potassium resources and needed to import a large quantity of potassium compounds for its fertilizer sector. About 95% of potash resources were located in Qinghai Province and the Xinjiang Uygur Autonomous Region, where brine was located. As a result, most potassium salt producers were located in the Charhan area of Qinghai Province. During the past several years, production of potassium

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chloride increased to about 3.8 Mt in 2011 from 700,000 t in 2003. Domestic demand exceeded supply, however, and the country imported a large quantity of potassium compounds from overseas markets to meet the demand. According to the Government's 12th five-year plan, domestic potash production could produce 4.5 Mt of potash, or 60% of the country's demand in 2015. The Government projected that Qinghai Salt Lake Industry Co. Ltd. (also known as Qinghai Yanhu Industry Group Co. Ltd.) would increase its output capacity by 1 Mt/yr of potassium chloride and that Xinjiang Lop Nur Potassic Scientific and Technology Development Co. Ltd. would add about 200,000 t/yr of capacity. The Government also intended to develop potassium resources in the Provinces of Gansu, Sichuan, and Yunnan; however, potassium production costs from these areas were expected to be higher than those in Qinghai, and these plants' output capacities would be smaller. In 2011, China imported about 4.1 Mt of potassium compounds (potassium oxide equivalent) and would continue to import potassium compounds to meet the country's demand during the next several years. With the encouragement of the Government, enterprises had invested in several potash projects in Canada and Laos (China Chemical Reporter, 2012c).

Potassium magnesium sulfate had been widely used in the fertilizer sector. Owing to high prices, the annual demand for potassium magnesium sulfate was small, about 300,000 t. Xinjiang Lop Nur Potassic Scientific and Technology Development Co. was the leading potassium magnesium sulfate producer. In China, potassium magnesium sulfate was produced from the tailings of potassium sulfate and potassium chloride production from brine, and most potassium magnesium sulfate producers were located in Qinghai and Xinjiang; however, most consumers were located in the central and southern parts of the country. Even though potassium magnesium sulfate was produced as a byproduct of other operations under the Government's encouragement of utilization of resources, producers were required to pay a resource tax on it. In December 2011, the NDRC and the Ministry of Railway jointly issued a statement indicating that potassium magnesium sulfate was to be included in the catalog of agricultural fertilizer products that have preferential rail transport prices, that it could qualify for preferential freight rates, and that it could be exempt from the railway construction tax. Domestic analysts estimated that the consumption of potassium magnesium sulfate could reach 800,000 t/yr by 2015 (China Chemical Reporter, 2012b).

Rare Earths.—China was rich in rare-earth resources, and the country produced different kinds of rare-earth products. China's rare-earth production accounted for about 90% of the world total, and the volume of exports had a significant effect on the world markets. During the past several years, the Government adjusted the rare-earth production and export quota to protect the domestic resources and the environment. Rare-earth consumption in China had increased steadily, and the country consumed more than 80,000 t/yr of rare earths during the past 2 years compared with 19,300 t in 2000. To maintain the same volume of rare-earth production, the Government decided to reduce the rare-earth export quota to about 30,000 t in 2010 and 2011 from 65,000 t in 2005. China, however, continued to have difficulty controlling rare-earth prices in the world because a significant volume of rare-earth products was exported through unofficial channels. Domestic analysts estimated that about 20,000 t/yr of rare-earth products was unaccounted for (China Metal Bulletin, 2012h).

During the period between 2005 and 2009, the average export price of rare-earth products was less than $10 per kilogram [freight on board (FOB)]. In 2010, the average export price of rare-earth products increased to $23.4 per kilogram because the Government reduced the export quota to 30,300 t (gross weight) from 50,100 t in 2009 and ordered rare-earth producers to abide by the assigned production quota. The total export volume of rare-earth products was 40,385 t (gross weight) in 2010. In 2011, the Government assigned a 30,184 t (gross weight) rare-earth export quota, but the total export volume of rare-earth products was 16,122 t (gross weight), and the average export price of rare-earth products was $159.4 per kilogram (FOB). The decrease in the volume of exports was attributed to strong rare-earth prices in the domestic market. In 2011, the domestic price of europium oxide increased to $4,722 per kilogram in July from $474 per kilogram in January. Because of the high price, many overseas buyers delayed their purchases. Another reason was that rare-earth producers and traders stockpiled their products, resulting in less supply of rare-earth products in the domestic market. The Government also refused to approve any exports of rare-earth products for which the quoted sale price was less than the domestic market price plus all required taxes (China Metal Bulletin, 2011a).

The State Council issued "Opinions on the Promotion of Sustainable and Healthy Development of the Rare Earth Industry," which provided a plan for the development of the country's rare-earth industry during the next several years. The goal was to establish orderly rare-earth operations, including the development of rare-earth resources, followed by separation, smelting, and marketing. The Government would control unregulated exploitation, environmental damage, unregulated production capacity expansion, and illegal trading. Later, the State Council published a paper on the policy and development of China's rare-earth industry (also known as China's rare-earth white paper). According to the document, China's rare-earth reserves accounted for 23%, or 18.59 Mt, of the world's total reserves of 82.59 Mt. In 2011, China produced 96,900 t of rare-earth smelting products, accounting more than 90% of the world's total. During the past several years, China's rare-earth production had not only satisfied domestic demand but also supplied the world's demand. After more than 50 years of exploitation, however, China's rare-earth reserves had decreased rapidly, especially in major mining areas. In Baotou, only 10% of rare earths had been utilized, and the recovery rate of ion adsorption rare earths was less than 50%. In the southern part of the country, where ion adsorption rare earths are located, for each ton of rare-earth product produced, 2,000 t of tailings was generated. Excess exploitation had caused landslides, health and safety issues for local residents, and damage to the environment. In the past, the value of rare earths was not reflected in its selling price and also the damage to the environment was not accounted for. In the future, the development of China's rare-earth sector was expected to be focused on technological innovation and on the scientific application of rare earths and

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a balance between exploitation and environmental protection (China Nonferrous Metals News, 2012; State Council, The, 2012a, p. 2–14).

In 2011, the MLR announced that the exploitation quota for rare-earth concentrate was 89,200 t [rare-earth oxide (REO) equivalent], of which 77,000 t was light rare earths and 12,200 t was medium and heavy rare earths. Neither the MLR nor the MIIT announced any exploitation or production quotas for 2012; however, individual Provinces received allocations on both types for the first 6 months and instructions to distribute these quotas accordingly. Without any compiled information, outsiders had difficulty knowing the total production target that was set by the Government. Some rare-earth producers indicated that this arrangement made it easier for their planning. In 2011, when prices of rare earths increased significantly during the first half of the year, rare-earth producers increased their output. Some producers fulfilled their production quota in the first 8 months of the year. State-owned Minmetals Corp. called for rare-earth producers to suspend their operations to "ensure the stable operation of the rare-earth market." Neither Minmetals nor its joint-venture partners had rare-earth mining operations in China in 2011 (China Metal Bulletin, 2012c).

The consolidation of the rare-earth industry continued in 2011. The Government of Nei Mongol Autonomous Region assigned Baotou Iron and Steel [through its subsidiary Baotou Rare Earth Hi-Tech Holding Co. Ltd. (Baotou Hi-Tech)] to be the sole producer and manager of all rare-earth mining, separation, and trading activities in the Autonomous Region. Those domestic producers in the Autonomous Region that met the asset transfer requirement were required to sell their assets to Baotou Hi-Tech. The remainder would be shut down without compensation. The consolidation of 35 rare-earth producers was set to be completed in June 2011; however, many rare-earth producers refused to shut down. Many of these producers received local governments' approval for their operations, and the supply of raw materials was from local small miners; these producers expected Baotou Iron and Steel to provide reasonable compensation for their assets. After further negotiations, 22 rare-earth producers agreed to shut down their operations and 13 rare-earth producers merged into Baotou Hi-Tech (China Nonferrous Metals, 2011b).

After it had completed the consolidation of the rare-earth sector in Nei Mongol, Baotou Iron and Steel proposed to establish a state-owned China Northern Rare Earth (Group) Hi-Tech Co. Ltd., which would include rare-earth producers from the Provinces of Shandong and Sichuan. The company would invest in the development of innovative technologies to improve mining, smelting, and product development. This would further consolidate the rare-earth sector in the northern part of China, where most of the light rare-earth producers were located. The government of Sichuan Province approved the formation of a joint venture between state-owned Sichuan Geological and Mineral Resources Co. Ltd. and privately owned Sichuan Hanlogn Group for the purpose of acquiring Leshan Shenghe Rare Earth Technology Co. Ltd., which was a rare-earth miner in Sichuan. The rare-earth output of Shenghe accounted for 50% of the Province's total and was the only Sichuan company that had an export quota issued by the MOC. Jiangxi Copper Co. Ltd. was another legal rare-earth producer in Sichuan. A state-owned research institute, China Iron and Steel Research Institute Group, acquired the Shandong Weishan Lake Rare Earth Co. Ltd. from Weishan Huaneng Co., Cuzhuang Coal Mining Co., and Aerospace Industry Foundation. Weishan Lake operated the Weishan Lake Mine in Weishan, Shandong Province (China Minin and Metals Weekly, 2011; China Nonferrous Metals Monthly, 2011, 2012).

The Government planned to have three integrated rare-earth enterprises in the southern part of country, where the middle and heavy rare earths are located, to produce more than 80% of the country's middle and heavy rare earth output. The government of Jiangxi Province issued more than 80 mining licenses to Ganzhou Rare Earth Co. Ltd. after the consolidation and shutdown of illegal rare-earth mining activities in the Ganzhou area during early 2000. The MLR planned to reduce rare-earth mining licenses to about 40 from 80 in the Ganzhou area in 2012. Ganzhou Rare Earth would receive nearly all these mining licenses. Baotou Iron and Steel, Chinalco, and Minmetals had set up joint ventures with local rare-earth producers in Jiangxi; however, none of them had mining licenses. The local government was reluctant to give up or transfer these rare-earth mining licenses to state-owned companies (China Metal Bulletin, 2011b).

The Provincial Government of Guangdong established a Guangdong Rare Earth Industry Group to manage the rare-earth sector in Guangdong. Guangdong-based Guangdong Rising Group Co. Ltd., which was the parent company of Guangdong Rising Nonferrous Metals Co. Ltd. and which had two of the four rare-earth mining licenses in Guangdong, was a member of the Guangdong Rare Earth Industry Group. The Guangdong Rare Earth Group could be in charge of the integration of the mining, smelting, and development of high-value-added products in the Province. The Provincial Government of Fujian also planned to establish an integrated rare-earth enterprise in the Province. It appeared that local governments wanted to protect their own rare-earth resources and had no intention of letting state-owned enterprises participate in the reform of their rare-earth sectors, except in the Provinces of Guangxi and Hunan (China Nonferrous Metals, 2012a, b).

After more than 4 years of preparation, China Rare Earth Industry Association was established and placed under the supervision of the MIIT. The functions of the association were to provide guidelines for the development of the rare-earth sector, to collect and analyze statistical information, to brief producers about the Government's policies, to deliver producers' suggestions to the Government, and to regulate the rare-earth market in China. The first task for the association was to provide suggestions on controlling the unregulated mining and export of rare earths, to enforce the rare-earth production quota, and to amend regulations on the management of the rare-earth sector (China Metal Bulletin, 2012c).

Mineral Fuels

Coal.—China had undergone significant economic reform and had one of the world's fastest growing economies. Coal consumption had increased to meet the high demand for

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industrial production and power generation. Coal was the country's primary source of energy—two-thirds of the country's electricity was produced by coal-fired powerplants. About 50% of the country's total coal output was consumed by the power sector. Even though China's coal production continued to increase in 2011 because of an increase in demand for coal by every industrial sector, China became a net coal importing country. In 2011, the country imported a total of 182.4 Mt of coal, which accounted for less than 4% of total demand, from Australia, 35%; Indonesia, 24%; Vietnam, 19%; Russia, 9%; Mongolia, 5%; North Korea, 3%; and others, 5%. China exported a total of 14.6 Mt of coal to the Republic of Korea, 44%; Japan, 29%; Taiwan, 22%; and others, 5% (General Administration of Customs of the People's Republic of China, 2012).

The State Council urged Provincial governments to speed up their consolidation efforts, to reduce mine accidents, and to encourage cross-sector and regional mergers. Provincial governments were urged to provide financial and technological support to coal enterprises during their transformation into more efficient and safe coal producers. The consolidation of the coal sector would lead to 10 large coal enterprises with output capacities of more than 100 Mt/yr and 10 coal enterprises with output capacities of 50 Mt/yr. The number of coal producers would be reduced to about 4,000 by 2015. The top 20 large coal enterprises would account for about 60% of the country's coal output. The average annual production of each coal company would increase to more than 1 Mt from 300,000 t. In 2015, the country would have coal output capacity of 4.1 Gt, and coal production and consumption would be controlled at 3.9 Gt. During the past 5 years (2001 to 2005), China's output capacity had increased by 360 Mt/yr, of which the western part of country accounted for 230 Mt/yr; the central part, 110 Mt/yr; and the eastern part, 20 Mt/yr. The Government intended to add 740 Mt/yr of new output capacity by 2015, of which the western part of the country would build 530 Mt/yr; the central part, 185 Mt/yr; and the eastern part, 25 Mt/yr. The Provinces of Gansu, Shaanxi, and Shanxi and Autonomous Regions of Nei Mongol, Ningxi, and Xinjiang would construct a combined 650 Mt/yr of new capacity. In 2015, the distribution of the country's coal output would be to the western part of the country, 2.09 Gt; the central part, 1.35 Gt; and the eastern part, 460 Mt. China's railway would transport a total 2.6 Gt of coal mainly from the western part of the country to the southern and eastern parts of the country (National Development and Reform Commission, 2012, p. 7–14).

Outlook

China's economy is expected to continue to grow in the near future. The country has replaced Japan as the second largest economy in the world behind the United States, and the Government has set the economic growth rate target at 7% for the next 5 years. The Government recognizes that the country cannot depend solely on exports to sustain its economic growth and that the country needs to increase domestic consumption and to have a more transparent financial and legal system. The expected continuation of China's economic growth implies that a strong demand for mineral commodities is likely to continue. China has shortages in supply of most major minerals, including bauxite, chromium, copper, iron, lead, manganese, nickel, oil, and potash, and it relies on imports to meet demand. This trend is expected to continue. The Government, therefore, encourages enterprises to invest in such mineral-rich countries as Australia, Brazil, Burma, Chile, Indonesia, and Mongolia to secure minerals for domestic economic development and growth. The Government is expected to continue its effort to protect the country's resources of minerals, such as antimony, coal, indium, molybdenum, rare earths, tin, and tungsten, and to avoid overexploitation.

China's imports of raw minerals have been increasing in recent years. As a result, the Chinese Government has been promoting reduced dependence on mineral commodity imports and encouraging the production of high-value-added and high-quality downstream products. The Government also promotes the secondary nonferrous metals industry to reduce energy consumption. The Government has not yet achieved great success in meeting these goals. As progress is made toward these goals, the country's dependence on most major mineral commodities could decline; however, China will likely continue to play an important role in the world's metal and mineral markets. Also, China's overseas investments will probably continue until the transition to resource independence takes place. China's overall outward investment is expected to continue to increase and may soon exceed inward foreign direct investment.

The environmental, health, safety, and social performance of the mining and metal enterprises are of concern to the Government. The Government has set guidelines for the development of these enterprises in an attempt to improve protection of the environment, but progress has been slow. The Government plans to continue its effort to address the sustainable development of the mining and metal sectors through air and water pollution prevention and treatment, land protection, mine safety, and reclamation of mine sites.

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TABLE 1

CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
METALS						
Aluminum:						
Bauxite, gross weight	thousand metric tons	30,000	35,000	40,000	44,000	45,000
Alumina	do.	19,500	22,800	23,800	29,000	34,100
Metal, refined:						
Primary	do.	12,600	13,200	12,900	16,200	18,100
Secondary	do.	2,750	2,700	3,100	4,000	4,100
Total	do.	15,400	15,900	16,000	20,200	22,200
Antimony:						
Mine, Sb content		163,000	166,000	140,000	150,000	150,000
Metal		147,000	158,000	168,000	193,000 r	200,000
Bismuth:						
Mine output, Bi content		3,500	5,000	6,000	6,500	6,000
Metal		12,100	13,100	12,300	14,000 r	12,500
Cadmium, smelter		4,210	6,960	7,050	7,360 r	7,000
Chromite, gross weight	thousand metric tons	200	200	200	200	200
Cobalt:						
Mine output, Co content		6,100	6,630	6,000	6,380 r	6,800
Metal		7,580	6,700	6,000	4,120 r	4,500
Copper:						
Mine output, Cu content		928,000	1,070,000	1,040,000	1,160,000	1,270,000
Metal:						
Smelter, primary	thousand metric tons	2,110	2,500	2,700	2,900	3,100
Refined:						
Primary	do.	2,400	2,700	2,750	2,950	3,390
Secondary	do.	1,200	1,200	1,400	1,700	1,800
Total	do.	3,600	3,900	4,150	4,650	5,190
Gold, mine output, Au content		275	285	320	345	362
Indium, primary and secondary		380	340	340	330	380
Iron and steel:						
Iron ore, gross weight	thousand metric tons	707,000	824,000	880,000	1,070,000	1,330,000
Pig iron[4]	do.	476,520	470,670	552,830	597,330	640,510
Ferroalloys	do.	17,500	18,300	22,100	24,300	28,400
Steel, crude[4]	do.	489,290	500,490	572,180	637,230	685,280
Steel, rolled[4]	do.	565,610	584,770	694,050	802,760	886,190
Lead:						
Mine output, Pb content	do.	1,410	1,550	1,600	1,980 r	2,400
Metal:						
Smelter, primary	do.	2,040	2,430	2,630	2,800	3,300
Refined:						
Primary	do.	2,140	2,350	2,630	2,800 r	3,200
Secondary	do.	650	850	1,150	1,360	1,400
Total	do.	2,790	3,200	3,780	4,160 r	4,600
Magnesium, metal and alloy		625,000	559,000	501,000	654,000	675,000
Manganese:						
Ore, Mn content	thousand metric tons	2,000	2,200	2,400	2,600	2,800
Metal		1,000,000	1,130,000	1,310,000	1,370,000	1,400,000
Mercury, mine output, Hg content		800	1,300	1,430	1,600	1,500
Molybdenum, mine output, Mo content		67,700	81,000	93,500	96,600 r	103,000
Nickel:						
Mine output, Ni content		67,000	79,500	84,800	80,000 r	89,800
Matte		105,000	114,000	143,000	139,000 r	150,000
Smelter		116,000	129,000	165,000	159,000 r	175,000

See footnotes at end of table.

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TABLE 1—Continued

CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
METALS—Continued						
Niobium and tanlatum, mine output:						
Nb_2O_5 content		270	300	30	32	30
Ta_2O_5 content		920	900	90	86 r	90
Silicon, metal		1,080,000	1,100,000	993,000	1,140,000 r	1,050,000
Silver, mine output, Ag content		2,700	2,800	2,900	3,500	3,700
Tin:						
Mine output, Sn content		146,000	110,000	97,200	115,000	120,000
Metal		149,000	140,000	140,000	149,000 r	156,000
Titanium:						
Ilmenite, TiO_2 equivalent		550,000	550,000	550,000	700,000 r	850,000
Sponge		45,200	57,000	45,800	57,000 r	68,000
Tungsten, mine output, W content		41,000	50,000	51,000	59,100	61,800
Vanadium, V_2O_5 in vanadiferous slag product		45,200	46,000	52,000	58,000 r	65,000
Zinc:						
Mine output, Zn content	thousand metric tons	3,040	3,340	3,330	3,840 r	4,050
Refined:						
Primary	do.	3,710	4,000	4,200	5,030 r	5,040
Secondary	do.	30	37	90	175 r	173
Total	do.	3,740	4,040	4,290	5,210 r	5,210
INDUSTRIAL MINERALS						
Asbestos		390,000	380,000	440,000	400,000	440,000
Barite	thousand metric tons	4,400	4,600	3,400 r	4,000	4,100
Bentonite	do.	3,300	3,300	3,400	3,400	3,500
Boron, mine, B_2O_3 equivalent		145,000	140,000	145,000	150,000	150,000
Bromine		137,000	135,000	93,000 r	100,000 r	100,000
Cement, hydraulic[4]	million metric tons	1,361	1,400	1,644	1,882	2,099
Diatomite		420,000	440,000	440,000	400,000	440,000
Dolomite	thousand metric tons	8,000	8,000	8,100	8,200	8,200
Feldspar	do.	2,000	2,000	2,000	2,000	2,100
Fluorspar	do.	3,200	4,200 r	3,800 r	4,600 r	4,200
Graphite		800,000	650,000	450,000 r	700,000 r	800,000
Gypsum	thousand metric tons	4,800	4,600	4,500	4,700	4,700
Kaolin	do.	3,210	3,200	3,000	3,260 r	3,200
Lime	do.	170,000	180,000	185,000	190,000	200,000
Lithium minerals, all types		22,000	25,000	26,000	27,000	29,000
Magnesite	thousand metric tons	14,000	15,600	13,000 r	14,000	14,500
Mica		720,000	750,000	700,000	750,000	760,000
Nitrogen, N content of ammonia[4]	thousand metric tons	42,480	41,140	42,290	40,870	43,250
Phosphate rock, P_2O_5 equivalent	do.	15,100	15,200	18,000	20,400	24,000
Potash, marketable, K_2O equivalent	do.	2,600	2,750	3,200	3,600 r	3,800
Rare earths, rare-earth oxide equivalent		120,000	125,000	129,000	120,000	105,000
Salt[4]	thousand metric tons	61,670	66,640	66,630	70,380	67,420
Sodium compounds:						
Mirabilite	do.	6,600	6,600	6,000	6,500	6,000
Soda ash, natural and synthetic[4]	do.	17,650	18,540	19,450	20,350	22,940
Strontium carbonate		330,000	335,000	159,000	200,000	200,000
Sulfur:						
Native	thousand metric tons	960	960	1,000	1,100	1,100
Content of pyrite	do.	4,200	4,300	4,370	4,400	4,400
Byproduct, all sources	do.	3,300	3,350	4,000	4,100	4,200
Total	do.	8,460	8,610	9,370	9,600	9,700
Talc and related materials	do.	2,000	2,200	2,300	2,000	2,200

See footnotes at end of table.

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TABLE 1—Continued

CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand metric tons	450,000	447,000	426,000 r	550,000	450,000
Bituminous	do.	2,000,000	2,110,000	2,320,000 r	2,450,000	2,800,000
Lignite	do.	100,000	196,000	256,000 r	240,000	270,000
Total	do.	2,550,000	2,750,000	3,000,000 r	3,240,000	3,520,000
Coke, all types[4]	do.	335,530	323,590	345,020	388,640	432,710
Gas, natural:						
Gross	billion cubic meters	69	80	85	95	102
Marketed	do.	57	68	73	83	90
Petroleum:						
Crude, including crude from oil shale	million 42-gallon barrels	1,360	1,380	1,370	1,480 r	1,480
Refinery products	do.	3,500	3,700	3,750	4,220	4,470

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[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through October 1, 2012.

[3]In addition to the commodities listed, China also produces diamond, gallium, germanium, platinum-group metals, rhenium, selenium, stone, tellurium, uranium, and zicronium, but available information is inadequate to make reliable estimates of output.

[4]Reported by China's National Statistical Bureau.

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TABLE 2
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Aluminum:			
Alumina	Chongqing Aluminum Co. [Aluminum Corporation of China (Chinalco)]	Chongqing	800
Do.	Chongqing Dingtai Tuoyuan Alumina Co.	do.	150
Do.	Nanchuan Pioneer Alumina Co.	do.	200
Do.	Guangxi Huayin Aluminum Co. Ltd.	Guangxi, Bose	1,600
Do.	Pingguo Aluminum Co. [Aluminum Corporation of China (Chinalco)]	Guangxi, Pingguo	1,200
Do.	Guizhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Guizhou, Guiyang	1,200
Do.	Chalco Zunyi Aluminum Co. Ltd.	Guizhou, Zunyi	800
Do.	Luoyang Wanji Xiangjiang Aluminum Co. Ltd.	Henan, Luoyang	800
Do.	Sanmenxia Yixiang Aluminum Co. Ltd. (Henan Yima Coal Group)	Henan, Mainchi	600
Do.	Pingdingshan Huiyuan Chemical Co.	Henan, Pingdingshan	300
Do.	Yangquan Coalmine Aluminum (Sanmenxia) Co. Ltd.	Henan, Sanmenxia	1,200
Do.	Orient Hope (Sanmenxia) Aluminum Co. Ltd.	do.	1,200
Do.	Zhengzhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Henan, Zhengzhou	2,600
Do.	Zhongzhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Hunan, Zhongzhou	3,000
Do.	Shandong Huayu Alumina Co. Ltd. (Shandong Chiping Xinfa Aluminum and Electricity Group)	Shandong, Chiping	1,800
Do.	Longhou Donghai Alumina Co. Ltd. (Nanshan Group)	Shandong, Nanshan, Longkou	1,600
Do.	Shandong Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Shandong, Zibo	1,500
Do.	Bingzhou Weiqiao Aluminum Co.	Shandong, Zouping	1,600
Do.	Shanxi Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Shanxi, Hejin	2,200
Do.	Liulin Senze Group	Shanxi, Liulin	600
Do.	Coalmine Aluminum (Sanmenxia) Co. Ltd.	Shanxi, Sanmenxia	1,200
Do.	Shanxi Luneng Jinbei Aluminum Co. Ltd.	Shanxi, Yuanping	2,000
Do.	Wenshan Aluminum Co. Ltd. (Yunnan Aluminum Co.)	Yunnan, Wenshan	800
Metal	Baiyin Aluminum Plant	Gansu, Baiyin	150
Do.	Lanzhou Aluminum Plant	Gansu, Lanzhou	210
Do.	Liancheng Aluminum Plant	do.	235
Do.	Yinhai Aluminum Co. Ltd.	Guangxi, Laibin	125
Do.	Pingguo Aluminum Co. [Aluminum Corporation of China (Chinalco)]	Guangxi, Pingguo	380
Do.	Guizhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Guizhou, Guiyang	400
Do.	Chalco Zunyi Aluminum Co. Ltd.	Guizhou, Zunyi	130
Do.	Henan Zhongfu Industry Co. Ltd.	Henan, Gongyi	180
Do.	Jiaozuo Wanfang Aluminum Co. Ltd.	Henan, Jiaozuo	420
Do.	Henan Wanji Aluminum Co. Ltd.	Henan, Luoyang	180
Do.	Henan Zhongmai Mianchi Aluminum Plant	Henan, Mianchi	400
Do.	Sanmenxia Tianyuan Aluminum Co. Ltd.	Henan, Sanmenxia	110
Do.	Shangqiu Aluminum Smelter	Henan, Shangqiu	180
Do.	Yichuan Yugang Longquan Aluminum Co.	Henan, Yichuan	600
Do.	Henan Shenhuo Aluminum-Electricity Co. Ltd.	Henan, Yongcheng	200
Do.	Zhengzhou Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Henan, Zhengzhou	60
Do.	Hanjiang Danjiangkou Aluminum Co. Ltd.	Hubei, Danjiangkou	110
Do.	Hunan Chuanquan Aluminum Co. Ltd.	Hunan, Taoyuan	210
Do.	Fushun Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Liaoning, Fushun	340
Do.	Baotou Aluminum Plant	Nei Mongol, Baotou	250
Do.	East Hope Aluminum Plant	do.	800
Do.	Qingtongxia Aluminum Plant (China Power Investment Corp. and Ningxia Qingtongxia Energy Group Co. Ltd.)	Ningxia, Qingtongxia	1,150
Do.	Qiaotou Aluminum Co. Electrolysis Branch	Qinghai, Datong	750
Do.	Qinghai Aluminum Smelter [Aluminum Corporation of China (Chinalco)]	Qinghai, Xining	560
Do.	Qinghai West Mining Baihe Aluminum Co. Ltd.	do.	112
Do.	Tongchuan Xingguang Aluminum Co. Ltd.	Shaanxi, Tongchuan	250
Do.	Shandong Chiping Xinfa Aluminum and Power Group	Shandong, Chiping	360
Do.	Taishan Aluminum-Power Co. Ltd.	Shandong, Fecheng	125

See footnotes at end of table.

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TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Aluminum—Continued:				
Metal—Continued		Shandong Nanshan Aluminum Co. Ltd. (Nanshan Group)	Shandong, Nanshan, Longkou	156
Do.		Shandong Aluminum Plant [Aluminum Corporation of China (Chinalco)]	Shandong, Zibo	120
Do.		Bingzhou Weiqiao Aluminum Co.	Shandong, Zouping	250
Do.		Zouping Aluminum Co. Ltd.	do.	150
Do.		Huaze Aluminum and Power Co. Ltd.	Shanxi, Hejin	400
Do.		New Orient Aluminum Co. Ltd.	Shanxi, Taiyuan	75
Do.		Shanxi Guanlv Aluminum Co. Ltd.	Shanxi, Yuncheng	210
Do.		Yunnan Aluminum Plant	Yunnan, Kunming	500
Antimony		Huaxi (China Tin) Group Industrial Co.	Guangxi, Hechi	25
Do.		Hunan Chenzhou Mining Group Co. Ltd.	Hunan, Yuanling	20
Do.		Xikuangshan Twinkling Star Antimony Co. Ltd.	Hunan, Lengshuijiang	37
Asbestos		China National Nonmetallic Industry Corp.	Nei Mongol, Baotou; Shanxi, Lai Yuan, and Lu Liang	130
Barite		do.	Guizhou, Xiangshou	NA
Bismuth	metric tons	Guangzhou Smelter	Guangdong, Guangzhou	300
Do.	do.	Hunan Bismuth Industry Co. Ltd.	Hunan, Chouzhou	3,500
Do.	do.	Shizhuyuan Nonferrous Metals Co. Ltd.	Hunan, Shizhuyuan	1,200
Do.	do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	350
Do.	do.	Yunnan Copper Group Co. Ltd.	Nei Mongol, Chifeng	300
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	300
Cadmium	do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	1,000
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	800
Coal		Hebei Provincial Government	Hebei	70,000
Do.		Heilongjiang Provincial Government	Heilongjiang	100,000
Do.		Henan Provincial Government	Henan	100,000
Do.		Liaoning Provincial Government	Liaoning	70,000
Do.		Nei Mongol Provincial Government	Nei Mongol	90,000
Do.		Shandong Provincial Government	Shandong	60,000
Do.		Shanxi Provincial Government	Shanxi	400,000
Do.		Sichuan Provincial Government	Sichuan	80,000
Do.		Shenhua Coal Corp.	Nei Mongol, Ningxia, and Shaanxi	150,000
Cobalt	metric tons	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	10,000
Do.	do.	Huayou Cobalt Co. Ltd.	Zhejiang, Tongxiang	3,000
Copper, refined		Jinchang Smelter (Tongling Nonferrous Metals Group Holding Co. Ltd.)	Anhui, Tongling	170
Do.		Jinlong Smelter (Tongling Nonferrous Metals Group Holding Co. Ltd.)	do.	400
Do.		Wuhu Smelter (Hengxin Copper Industry Group Co.)	Anhui, Wuhu	60
Do.		Zijin Copper Co. Ltd.	Fujian, Shanghang	200
Do.		Baiyin Nonferrous Metals Group Co. Ltd.	Gansu, Baiyin	100
Do.		Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	600
Do.		Luoyang Copper Processing Factory	Henan, Luoyang	50
Do.		Daye Nonferrous Metals Co.	Hubei, Daye	400
Do.		Zhangjiagang United Copper Co. (Tongling Nonferrous Metals Group Holding Co. Ltd.)	Jiangsu, Zhangjiagang	200
Do.		Guixi Smelter (Jiangxi Copper Co. Ltd.)	Jiangxi, Guixi	1,200
Do.		Dongfang Copper Co. (Huludao Nonferrous Metals Group)	Liaoning, Huludao	100
Do.		Chifeng Jingeng Copper Co. Ltd.	Nei Mongol, Chifeng, Harqin Banner	100
Do.		Shandong Dongying Fangyuan Nonferrous Metals Co. Ltd.	Shandong, Dongying	400
Do.		Shandong Jinsheng Nonferrous Metals Corp.	Shandong, Linyi	100
Do.		Yanggu Xiangguang Copper Co. Ltd. (Shandong Fengxiang Group)	Shandong, Liaocheng, Yanggu	600
Do.		Yantai Penghui Copper Industry Co. Ltd.	Shandong, Yantai	200

See footnotes at end of table.

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TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Copper, refined—Continued		Taiyuan Copper Industry Co.	Shanxi, Taiyuan	100
Do.		Zhongtiaoshan Nonferrous Metals Co.	Shanxi, Yuangu	100
Do.		Huili Kunpeng Co. Ltd.	Sichuan, Huili	100
Do.		Tianjin Datong Copper Co. Ltd. (formerly Tianjin Copper Electrolysis Factory)	Tianjin	200
Do.		Yunnan Smelter (Chinalco Yunnan Copper Group Co. Ltd.)	Yunnan, Kunming	250
Do.		Hangzhou Fuchunjiang Smelting Co. Ltd.	Zhejiang, Fuchunjiang	100
Gallium	metric tons	Shandong Aluminum Plant	Shandong, Zibo	10
Gas, natural	billion cubic meters	China National Petroleum Corp.	Sichuan	10
Germanium	metric tons	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	30
Do.	do.	Nanjing Germanium Co. Ltd.	Jiangsu, Nanjing	30
Do.	do.	Nei Mongol Xilingol Tongtai Germanium Refine Co. Ltd.	Nei Mongol, Xilinhot	20
Do.	do.	Shanghai Lontai Copper Co. Ltd.	Shanghai	10
Do.	do.	Yunnan Lincang Xinyuan Germanium Co. Ltd.	Yunnan, Lincang	30
Do.	do.	Yunnan Chihong Zinc and Germanium Industrial Co. Ltd.	Yunnan, Qujing	50
Gold, refined	do.	Zijin Copper Co. Ltd.	Fujian, Shanghang	5
Do.	do.	China National Gold Corp.	Henan, Lingbao	10
Do.	do.	Zhongyan Gold Smelter (Zhongjin Gold Co. Ltd.)	Henan, Sanmenxia	30
Do.	do.	Jiangxi Copper Co. Ltd.	Jiangxi, Guixi	20
Do.	do.	Laizhou Gold Co.	Shandong, Laizhou	15
Do.	do.	Yanggu Xiangguang Copper Co. Ltd. (Shandong Fengxiang Group)	Shandong, Liaocheng, Yanggu	20
Do.	do.	Shandong Yanggu Xiangguang Co. Ltd.	Shandong, Yanggu	20
Do.	do.	Yantai Penghui Copper Industry Co. Ltd.	Shandong, Yantai	5
Do.	do.	Zhaoyuan Gold Co.	Shandong, Zhaoyuan	15
Do.	do.	Great Wall Gold Silver Refinery	Sichuan, Chengdu	100
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	130
Graphite		Jixi Aoyu Graphite Co. Ltd.	Heilongjiang, Jixi and Luo	60
Do.		Nei Mongol Xinghe Jingxin Graphite Co. Ltd.	Nei Mongol, Xinghe	10
Indium	metric tons	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	25
Do.	do.	Guangxi Tanghan Zinc & Indium Co. Ltd.	Guangxi, Hechi	30
Do.	do.	Laibin Smelter [Liuzhou Huaxi (China Tin) Group Co.]	Guangxi, Laibin	50
Do.	do.	Guangxi Debang Technology Co. Ltd.	Guangxi, Liuzhou	75
Do.	do.	Liuzhou Zinc Products Co.	do.	20
Do.	do.	Yintai Technology Co. Ltd.	do.	40
Do.	do.	Yuguang Gold-Lead Co. Ltd.	Henan, Jiyuan	10
Do.	do.	Xiangtan Zhengtan Nonferrous Metal Co. Ltd.	Hunan, Xiangtan	75
Do.	do.	Zhuzhou Smelter	Hunan, Zhuzhou	60
Do.	do.	Nanjing Germanium Co. Ltd.	Jiangsu, Nanjing	150
Do.	do.	Nanjing Sanyou Electronic Material Co. Ltd.	do.	50
Do.	do.	Huludao Nonferrous Metals Group Co.	Liaoning, Huludao	50
Do.	do.	Yunnan Chengfeng Nonferrous Metals Co. Ltd.	Yunnan, Gejiu	10
Do.	do.	Yunnan Mengzi Mining and Smelting Co. Ltd.	Yunnan, Honghe	30
Iron and steel:				
Iron ore		Ma'anshan Iron and Steel Co.	Anhui, Maanshan	10,000
Do.		Shoudu (Capital) Mining Co.	Beijing	20,000
Do.		Jiuquan Iron and Steel Co.	Gansu, Jiayuguan	4,000
Do.		Hainan Iron Mine	Hainan, Changjiang	4,600
Do.		Handan Xingtai Metallurgical Bureau (Hebei Iron and Steel Group Co.)	Hebei, Handan	3,800
Do.		Tangshan Iron and Steel Co. (Hebei Iron and Steel Group Co.)	Hebei, Tangshan	3,000
Do.		Wuhan Iron and Steel (Group) Co. (Wugang)	Hubei, Wuhan	5,100
Do.		Meishan Metallurgical Co.	Jiangsu, Nanjing	2,000
Do.		Banshigou Iron Mine Mining Co.	Jilin, Hunjiang	1,400
Do.		Anshan Mining Co.	Liaoning, Anshan	30,000
Do.		Benxi Iron and Steel Co.	Liaoning, Benxi	13,700
Do.		Baotou Iron and Steel and Rare Earth Co.	Nei Mongol, Baotou	10,000

See footnotes at end of table.

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TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Iron and steel—Continued:			
Iron ore—Continued	Taiyuan Iron and Steel Co.	Shanxi, Taiyuan	4,000
Do.	Dabaoshan Mining Co.	Guangdong, Qujiang	1,670
Do.	Panzhihua Mining Co.	Sichuan, Panzhihua	13,000
Do.	Kunming Iron and Steel Co.	Yunnan, Kunming	1,400
Ferroalloys	Shoudu (Capital) Iron and Steel (Group) Co.	Beijing	35
Do.	Qingshan Holding Group Co. Ltd.	Fujian, Fu'an	300
Do.	Desheng Nickel Industry Co. Ltd.	Fujian, Luoyuanwan	920
Do.	Northwest Ferroalloy Co.	Gansu, Yongdeng	60
Do.	Zunyi Ferroalloy Co.	Guizhou, Zunhi	100
Do.	Zhejiang Huaguang Smelting Group	Jiangxi, Hengfeng	50
Do.	Jilin Ferroalloy Co.	Jilin, Jilin	250
Do.	Jinzhou Ferroalloy Co.	Liaoning, Jinzhou	90
Do.	Liaoyang Ferroalloy Co.	Liaoning, Liaoyang	70
Do.	Shanghai Iron and Steel Co. Ltd.	Shanghai	180
Do.	Emei Ferroalloy Co.	Sichuan, Emei	70
Do.	Hengshan Ferroalloy Co.	Zhejiang, Jiande	70
Crude steel	Ma'anshan Iron and Steel Co.	Anhui, Maanshan	10,000
Do.	Shoudu (Capital) Iron and Steel (Group) Co. (Shougang)	Beijing	4,000
Do.	Liuzhou Iron and Steel Group	Guangxi, Liuzhou	6,000
Do.	Handan Iron and Steel General Work (Hebei Iron and Steel Group Co.)	Hebei, Handan	12,000
Do.	Shougang Qianan Iron and Steel Co. Ltd. (Shougang)	Hebei, Qianan	7,800
Do.	Tangshan Iron and Steel Co. (Taigang) (Hebei Iron and Steel Group Co.)	Hebei, Tangshan	15,000
Do.	Wuhan Iron and Steel (Group) Co. (Wugang)	Hubei, Wuhan	12,000
Do.	Shagang Group Co. Ltd.	Jiangsu, Zhangjiagang	30,000
Do.	Anshan Iron and Steel (Group) Co. (Angang) (Anben Iron and Steel Group)	Liaoning, Anshan	16,000
Do.	Benxi Iron and Steel Co. (Bengang) (Anben Iron and Steel Group)	Liaoning, Benxi	6,000
Do.	Baotou Iron and Steel and Rare Earth Co. (Baogang Group)	Nei Mongol, Baotou	10,000
Do.	Baoshan Iron and Steel (Group) Corp. (Baosteel) [Baogang Group]	Shanghai	19,000
Do.	Shanghai Iron and Steel Co. Ltd.	do.	6,000
Do.	Shandong Jinan Iron and Steel Group Co. (Shandong Iron and Steel Group)	Shandong, Jinan	10,000
Do.	Shandong Laiwu Iron and Steel Group Co. (Shandong Iron and Steel Group)	Shandong, Laiwu	10,000
Do.	Taiyuan Iron and Steel Co. (Taigang)	Shanxi, Taiyuan	5,000
Do.	Panzhihua Iron and Steel (Group) Co. (Pangang)	Sichuan, Panzhihua	6,000
Do.	Xinjiang Biyi Iron and Steel Group (Baogang Group)	Xinjiang, Urumqi	6,000
Lead	Jiuhua Smelter (Tongling Nonferrous Metals Group Holding Co. Ltd.)	Anhui, Chizhou	80
Do.	Baiyin Nonferrous Metals Co. Ltd.	Gansu, Baiyin	80
Do.	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	100
Do.	Laibin Smelter [Huaxi (China Tin) Group Co.]	Guangxi, Laibin	100
Do.	Hechi Nanfang Nonferrous Metals Smelting Co. Ltd.	Guangxi, Hechi	80
Do.	Anyang Smelter (Yubei Metal Co.)	Henan, Anyang	160
Do.	Jiyuan Wangyang Smelter (Jiquan Wangyang Smeltery Group Co. Ltd.)	Henan, Jiaozuo	160
Do.	Jinli Smelter (Jiyuan Jinli Smelting Co.)	Henan, Jiyuan	300
Do.	Jiyuan Smelter (Yuguang Gold-Lead Co. Ltd.)	do.	350
Do.	Henan Lingye Co. Ltd.	Henan, Lingbao	100
Do.	Hanjiang Smelter	Hubei, Luhekou	50
Do.	Shuikoushan Nonferrous Metals Co. Ltd.	Hunan, Hengyang	100
Do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	100
Do.	Xuzhou Chunxing Alloy Co. Ltd.	Jiangsu, Xuzhou	150
Do.	Jiangxi Jinde Lead Co. Ltd.	Jiangxi, Shangrao	80
Do.	Huludao Nonferrous Metals Group Co. Ltd.	Liaoning, Huludao	30
Do.	Shaanxi Dongling Group	Shaaxi, Baoji	100
Do.	Yunnan Tin Co. Ltd. (Yunnan Tin Corp.)	Yunnan, Gejiu	100

See footnotes at end of table.

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TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Lead—Continued	Kunming Smelter	Yunnan, Kunming	100
Do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	100
Lithium, $LiCO_3$	Tibet Mineral Development Co. Ltd.	Gansu, Baiyin	5
Do.	Jiangxi Ganfeng Lithium Co. Ltd.	Jiangxi, Xinyu	3
Do.	Sichuan Ni/Co Guorun New Material Co. Ltd.	Sichuan, Pengshan	2
Do.	Sichuan Shehong Lithium Co. Ltd.	Sichuan, Shehong	2
Do.	Sichuan Tianqi Lithium Industry Co. Ltd. (Chengdu Tianqi Group Co. Ltd.)	Sichuan, Suining	10
Do.	Sichuan Aba Guangsheng Lithium Industrial Co. Ltd.	Sichuan, Wenchuan	2
Do.	Qinghai Yanhu Industry Group Co. Ltd.	Qinghai, Golmud	10
Do.	Qinghai CITIC Guoan Technology Development Co. Ltd.	do.	20
Do.	Qinghai Lithium Industry Co. Ltd.	Qinghai, Xining	20
Do.	Xinjiang Haoxin Lithium Salt Development Co. Ltd. (former Xinjiang Lithium Co.)	Xinjiang, Urumqi	5
Magnesium	Zunyi Titanium Co. Ltd.	Guizhou, Zunyi	24
Do.	Ningxia Huayuan Magnesium Group	Ningxia, Yinchuan	15
Do.	Huayu Interprises (Group) Ltd.	Shanxi, Jishan	35
Do.	Taiyuan Tongxiang Magnesium Metal Co. Ltd.	Shanxi, Taiyuan	45
Do.	Taiyuan Yiwei Magnesium Co. Ltd.	do.	21
Do.	Wenxi Biyun Magnesium Co. Ltd.	Shanxi, Wenxi	30
Do.	Wenxi Yinguang Magnesium Group	do.	40
Manganese, metal	Chongqing Tycoon Manganese Co. Ltd.	Chongqing	23
Do.	Guangxi Dameng Manganese Industry Co. Ltd.	Guangxi, Nanning	70
Molybdenum, concentrate	Luoyang Luanchuan Molybdenum Industry Group Co., Ltd.	Henan, Luanchuan	30
Do.	Jinduicheng Molybdenum Industry Group Co. Ltd.	Shaanxi, Huaxian	30
Nickel, refined	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	130
Do.	Guangxi Yulin Weinie Co. Ltd.	Guangxi, Bobai	18
Do.	Jiangxi Jiangli New Type Material Co. Ltd.	Jiangxi, Fenyi	10
Do.	Jilin Jien Nickel Industry Co. Ltd.	Jilin, Panshi	10
Do.	Inco New Nickel Materials (Dalian) Co. Ltd.	Liaoning, Dalian	32
Do.	Chengdu Electro-Metallurgy Factory	Sichuan, Chengdu	5
Do.	Huili Kunpeng Co. Ltd.	Sichuan, Huili	10
Do.	Xinjiang Fukang Smelter	Xinjiang, Fukang	15
Do.	Xinjiang Xinxin Mining Co. Ltd.	Xinjiang, Fuyun	7
Do.	Yuanjiang Nickel Industry Co. Ltd.	Yunnan, Yuxi	5
Palladium and platinum kilograms	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	3,500
Petroleum, crude	Shengli Bureau	Hebei, Shengli	33,500
Do.	Daqing Bureau	Heilongjiang, Daqing	55,000
Do.	Liaohe Bureau	Liaoning, Liaohe	15,000
Do.	Bohai Offshore Oil Corp.	Bohai	4,000
Do.	Nanhai East Corp.	Nanhai	5,000
Potash	Qinghai Yanhu Industry Group Co. Ltd.	Qinghai, Charhan	2,000
Do.	Xinjiang Lop Nur Potassic Salt Scientific and Technology Development Co.	Xinjiang, Ruoqiang	1,200
Rare earths	Fujian Changting Jinlong Rare Earth Co. Ltd.	Fujian, Changting	4
Do.	Gansu Rare Earths Co.	Gansu, Baiyin	32
Do.	Zhujiang Smelter	Guangdong, Guangzhou	5
Do.	Jiangyin Jiahua Advanced Material Resources Co. Ltd. (Neo Material Technologies)	Jiangsu, Jiangyin	3
Do.	Liyang Rhodia Rare Earth New Material Co. Ltd. (Rhodia Group)	Jiangsu, Liyang	12
Do.	Jiangsu Guosheng Rare Earth Co. Ltd.	Jiangsu, Taixing	5
Do.	Yixing Xinwei Leeshing Rare Earth Co. Ltd. (China Rare Earth Holdings Ltd.)	Jiangsu, Yixing	6
Do.	Dingnan Nanfang Rare Earth Co. Ltd.	Jiangxi, Ganzhou, Dingnan	4
Do.	Longnan Guangdong Rising Rare Earth Smelting Co. Ltd.	Jiangxi, Ganzhou, Longnan	4

See footnotes at end of table.

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TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Rare earths—Continued		Baotou Iron and Steel and Rare Earths Corp. (Baogang Group)	Nei Mongol, Baotou	55
Do.		Leshan Primet (Puruimei) New Materials Co. Ltd. (US Primet LLC)	Sichuan, Leshan	8
Do.		Sichuan Jiangxi Copper Rare Earth Co. Ltd. (Jiangxi Copper Co. Ltd.)	Sichuan, Mianning	18
Rhenium rhenate	metric tons	Guixi Smelter (Jiangxi Copper Co. Ltd.)	Jiangxi, Guixi	3
Salt		Shandong Haihua Group Co. Ltd.	Shandong, Weifang	1,400
Do.		Zigong Zhangjiaba Salt Chemical Plant	Sichuan, Zigong	250
Silver	metric tons	Zijin Copper Co. Ltd.	Fujian, Shanghang	125
Do.	do.	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	150
Do.	do.	Laibin Smelter [Huaxi (China Tin) Group Co.]	Guangxi, Laibin	80
Do.	do.	Daye Nonferrous Metals Co.	Hubei, Daye	300
Do.	do.	Jiyuan Smelter (Yuguang Gold-Lead Co. Ltd.)	Henan, Jiyuan	730
Do.	do.	Jiangxi Copper Co. Ltd.	Jiangxi, Guixi	430
Do.	do.	Huludao Nonferrous Metals Group Co. Ltd.	Liaoning, Huludao	80
Do.	do.	Yanggu Xiangguang Copper Co. Ltd. (Shandong Fengxiang Group)	Shandong, Liaocheng, Yanggu	600
Do.	do.	Yantai Penghui Copper Industry Co. Ltd.	Shandong, Yantai	80
Do.	do.	Great Wall Gold Silver Refinery	Sichuan, Chengdu	300
Do.	do.	Yunnan Chengfeng Nonferrous Metals Co. Ltd.	Yunnan, Gejiu	150
Do.	do.	Yunnan Tin Co. Ltd. (Yunnan Tin Corp.)	do.	160
Do.	do.	Yunnan Smelter (Yunnan Copper Group Co. Ltd.)	Yunnan, Kunming	450
Do.	do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	150
Selenium	do.	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	50
Do.	do.	Guixi Smelter (Jiangxi Copper Co. Ltd.)	Jiangxi, Guixi	300
Strontium, carbonate		Chongqing Chonglong Strontium Co. Ltd.	Chongqing	20
Do.		Chongqing Tongliang Redbutterfly Strontium Co.	do.	120
Do.		Shijiazhuang Zhengding Xian Jinshi Chemical Co. Ltd	Hebi, Shijiazhuang	55
Do.		Hebei Xinji Chemical Group	Hebei, Xinji	60
Do.		Nanjing Jinyan Strontium Co. Ltd.	Jiangsu, Lishui	25
Talc		China National Nonmetallic Industry Corp.	Guangxi, Longshen	130
Do.		do.	Liaoning, Haicheng	50
Do.		do.	Shandong, Qixia	5
Tellurium, concentrate	metric tons	Jiangxi Copper Co. Ltd.	Jiangxi, Guixi	50
Tin, smelter		Guihuacheng Smelter (Guangxi Pinggui PGMA Co. Ltd.	Guangxi, Hezhou	8
Do.		Laibin Smelter (Guangxi China Tin Group Co. Ltd.)	Guangxi, Laibin	25
Do.		Chenzhou Smelter (Yunnan Tin Co. Ltd.)	Hunan, Chenzhou	20
Do.		Nanshan Tin Co. Ltd.	Jiangxi, Nankang	10
Do.		Yunnan Chengfeng Nonferrous Metals Co. Ltd.	Yunnan, Gejiu	20
Do.		Yunnan Tin Co. Ltd. (Yunnan Tin Corp.)	do.	70
Do.		Yunnan Gejiu Zili Metallurgy Co. Ltd.	Yunnan, Huogudu	20
Titanium, sponge		Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	15
Do.		Guizhou Southwest Titanium Co. Ltd.	Guizhou, Guiyang	3
Do.		Zunbao Titanium Co. Ltd.	Guizhou, Tongzi	10
Do.		Zunyi Titanium Co. Ltd.	Guizhou, Zunyi	20
Do.		Tangshan Tianhe Titanium Co. Ltd.	Hebei, Tangshan	10
Do.		Luoyang Sun Rui Wanji Titanium Industry Co. Ltd.	Henan, Xinan	10
Do.		Chaoyang Baisheng Zirconium Co. Ltd.	Liaoning, Chaoyang	8
Do.		Chaoyang Jintai Titanium Co. Ltd.	do.	7
Do.		Fushun Titanium Co. Ltd.	Liaoning, Fushun	5
Do.		Jinzhou Huashen Nonferrous Metals Plant	Liaoning, Jinzhou	10
Do.		Baoti Titanium Industry Co. Ltd.	Shaanxi, Baoji	10
Do.		Gangqi Xinyu Titanium Co. Ltd.	Sichuan, Panzhihua	5
Do.		Hengwei Titanium Co. Ltd.	do.	5
Do.		Panzhihua Iron and Steel (Group) Co. (Pangang)	do.	15
Do.		Yunnan Metallurgical Group	Yunnan, Lufeng	10

See footnotes at end of table.

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TABLE 2—Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities[2]	Annual capacity[e]
Tungsten, concentrate	Ninghua Hangluoken Tungsten Mine (Amoi Tungsten Co. Ltd.)	Fujian, Ninghua	4
Do.	Shizhuyuan Nonferrous Metals Co.	Hunan, Chenzhou	5
Do.	Yaogangxian Tungsten Mine	Hunan, Yizhang	3
Do.	Jiangxi Tungsten and Rare Earth Co. Ltd.	Jiangxi, Gangzhou	15
Zinc	Northwest China Lead-Zinc Smelter (Baiyin Nonferrous Metals Co. Ltd.)	Gansu, Baiyin	150
Do.	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	270
Do.	Hechi Nanfang Nonferrous Metal Smelting Co. Ltd.	Guangxi, Hechi	200
Do.	Liuzhou Nonferrous Metal Smelting Co. Ltd. (former Liuzhou Zinc Products Factory)	Guangxi, Liuzhou	100
Do.	Yugang Gold-Lead Co. Ltd.	Henan, Jiyuan	250
Do.	Shuikoushan Nonferrous Metals Co. Ltd.	Hunan, Hengyan	60
Do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	500
Do.	Huludao Zinc Smelting Co. (Huludao Nonferrous Metals Group. Co. Ltd.)	Liaoning, Huludao	390
Do.	Zijin Bayannur Co. Ltd. (Zijin Mining Group)	Nei Mongol, Bayannar League	220
Do.	Chifeng NFC Kumba Hongye Zinc Co. Ltd. (China Nonferrous Metals Foreign Engineering and Construction Co. Ltd.)	Nei Mongol, Chifeng	230
Do.	Xingan Copper and Zinc Smelter	Nei Mongol, Xilinuole	100
Do.	Dongling Zinc Industry Co. Ltd. (Dongling Group)	Shaanxi, Baoji	250
Do.	Laibin Smelter	Yunnan, Laibin	60
Do.	Yunnan Jinding Zinc Co. Ltd. (Sichuan Hongda Group)	Yunnan, Lanping	120
Do.	Yunnan Chihong Zinc and Germanium Co. Ltd.	Yunnan, Qujing	280

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

[1]Most companies are owned by either the central Government or a Provincial government.

[2]Listed by Province or Autonomous Region, followed by locality.

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TABLE 3
CHINA: EXPORTS OF SELECTED MINERAL COMMODITIES IN 2011

Commodity	Quantity (metric tons)	Value (thousands)
METALS		
Aluminum:		
Alumina	76,280	$53,506
Metal and alloys:		
Unwrought	766,122	1,789,057
Semimanufactures	3,000,000	10,361,684
Antimony:		
Metal, unwrought	5,062	66,317
Oxide	41,995	512,728
Barium sulfate	2,890,000	241,911
Copper, metal and alloys:		
Unwrought	156,516	1,490,847
Semimanufactures	500,347	4,525,882
Indium, unwrought, including powder	105	69,025
Iron and steel:		
Pig iron and cast iron	870,000	440,978
Steel:		
Bars and rods	6,690,000	5,987,326
Shapes and sections	2,700,000	2,094,512
Sheets and plates	26,580,000	25,562,875
Tube and pipe	1,440,000	3,752,393
Wire of steel or iron	1,700,000	2,149,800
Ferroalloys	930,000	3,611,795
Scrap	25,095	12,813
Magnesium, metal and alloy:		
Unwrought, Mg not less than 99.8%	185,879	555,104
Other unwrought	99,362	328,377
Manganese, unwrought	56,386	201,768
Molybdenum, ores and concentrates	18,732	374,994
Silver, unwrought	1,178	1,303,603
Tin, metal and alloys, unwrought	1,227	38,222
Tungsten, tungstates	5,136	182,165
Zinc:		
Metal and alloys, unwrought	48,369	115,648
Oxide and peroxide	17,608	32,979
INDUSTRIAL MINERALS		
Cement	10,610,000	620,353
Fluorspar	720,000	133,809
Granite	8,040,000	256,840
Graphite, natural	440,000	365,181
Magnesia, fused	2,070,000	662,229
Rare-earth products	16,900	2,667,140
Talc	670,000	156,682
MINERAL FUELS AND RELATED MATERIALS		
Coal	14,660,000	2,716,845
Coke, semicoke	3,300,000	1,487,346
Petroleum:		
Crude oil	2,520,000	1,907,008
Refinery products	25,700,000	20,766,030

Source: General Administration of Customs of the People's Republic of China, 2011, China monthly exports and imports, no. 12.

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TABLE 4
CHINA: IMPORTS OF SELECTED MINERAL COMMODITIES IN 2011

(Metric tons unless otherwise specified)

Commodity		Quantity	Value (thousands)
METALS			
Aluminum:			
Bauxite		44,844,914	$2,057,746
Alumina		1,880,000	777,809
Metal and alloys, unwrought		333,123	827,960
Semimanufactures		577,364	3,592,775
Scrap		2,690,000	4,625,509
Chromium, chromite		9,440,000	2,663,791
Cobalt:			
Ore and concentrates		348,191	850,937
Unwrought and powder		11,057	175,504
Copper:			
Ore and concentrates		6,380,000	15,518,135
Anode		416,332	3,780,616
Metal and alloys, unwrought		3,291,469	28,976,396
Semimanufactures		781,623	7,828,354
Scrap		4,690,000	16,351,959
Iron and steel:			
Iron ore		686,080,000	112,406,539
Steel:			
Bars and rods		1,150,000	1,926,600
Seamless pipe		520,000	1,979,468
Shapes and sections		390,000	416,672
Sheets and plates		13,200,000	15,694,346
Scrap		6,770,000	4,136,390
Manganese ore		12,970,000	2,674,563
Nickel:			
Ore and concentrates		48,055,678	4,904,203
Metal, refined greater than 99.95% Ni		11,169	269,007
Metal, other refined		201,310	4,645,652
Titanium dioxide		228,528	703,812
INDUSTRIAL MINERALS			
Diamond	kilograms	3,342	6,147,250
Nitrogen, phosphorus, and potassium fertilizers:			
Compound fertilizers		1,020,000	531,911
Diammonium phosphate		90,000	58,573
Potassium chloride		6,400,000	2,691,321
Potassium sulfate		150,000	75,505
Urea		2,064	1,457
MINERAL FUELS AND RELATED MATERIALS			
Coal		182,400,000	20,911,394
Liquefied natural gas		12,210,000	5,765,585
Petroleum:			
Crude oil		253,780,000	196,664,467
Refinery products		40,600,000	32,698,702

Source: General Administration of Customs of the People's Republic of China, 2011, China monthly exports and imports, no. 12.

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The Mineral Industry of Fiji

By Lin Shi

Fiji has the most developed economy of the Pacific island countries. In 2011, Fiji's real gross domestic product (GDP) growth rate was about 2%, the value of the nominal GDP was about $3.4 billion, and the average annual inflation rate was about 7%. Fiji's mineral resources include copper, gold, limestone, and silver. Gross earnings from tourism were the leading source of Fiji's foreign exchange, followed by Fijian overseas remittances, which had been decreasing significantly in recent years (especially those from Kuwait and Iraq) (ANZ Pacific Quarterly, 2012; U.S. Central Intelligence Agency, 2012; U.S. Department of State, 2012). In August 2011, Nautilus Minerals Inc. of Canada acquired 14 special prospecting licenses to explore the potential mineral deposits offshore Fiji in an exploration area that covers 60,000 square kilometers of ocean floor; the licenses were each valid for 2 years. The company expected to find underwater deposits of high-grade copper, gold, silver, and zinc. Nautilus was the first foreign private company to do offshore exploration in Fiji (Nautilus Minerals Inc., 2011).

Government Policies and Programs

The Mineral Resources Department (MRD) is Fiji's national geological survey and mining organization. The MRD develops mining policies, provides geologic information, assists mining investors, and facilitates the exploration and development of mineral and petroleum resources in the country (Mineral Resources Department, 2012).

Production

In the second quarter of 2011 (the latest period for which data were available), the industrial production index (IPI) of Fiji's mining and quarrying sector was 43.1 based on the 2005 constant price, and the IPI for nonmetallic mineral products was 119.2. Gold production decreased by 11% to about 700 kilograms (kg) (reported as 22,504 troy ounces) in the first half of 2011 from 785 kg (reported as 25,239 troy ounces) in the same period of 2010. Silver production increased by 9% to 181 kg in the first half of 2011 from 166 kg in the same period of 2010 (Fiji Islands Bureau of Statistics, 2011).

Structure of the Mineral Industry

Fiji had one British-owned gold and silver mining company, one locally operated cement company, and several small locally operated industrial mineral quarries that produced construction materials, such as limestone, sand and gravel, and other construction aggregates. Fiji was a major regional gold producer, and it hosts several major porphyry copper-gold and epithermal gold mineralized deposits.

Mineral Trade

In 2011, the leading exports partners of Fiji were Australia (which received 14.3% of Fiji's exports), the United States (11%), Japan (6.3%), the United Kingdom (5.9%), Samoa (5.8%), and Tonga (5.1%). Fiji's major mineral commodity export was gold. The leading imports partners of Fiji were Singapore (which supplied 34.1% of Fiji's imports), Australia (16.3%), New Zealand (14.1%), and China (8.9%). Fiji's major mineral commodity import was petroleum products (U.S. Central Intelligence Agency, 2012).

Commodity Review

Metals

Bauxite and Alumina.—Aurum Exploration Ltd. mined bauxite in a 165-acre (66.8-hectare) area of Bua Province. In 2011, Aurum prepared to ship bauxite valued at $992,000 to China from the stockpile site at Niviqiri, and the company expected to expand its capacity to produce bauxite (Fijilive, 2012; Fijisun.com, 2012).

Copper.—At the Namosi copper mine, porphyry copper-gold and epithermal-style gold mineralization was being explored; however, mine development had been halted for years. The Fiji Ministry of Lands and Mineral Resources had expected the Namosi copper mine to begin operations by June 2012 and that Newcrest Mining Ltd. of Australia (the owner) would initially focus on about 15 significant copper and gold prospects that had been identified during previous exploration in the area; however, the Newcrest project remained on hold pending the completion of a prefeasibility study (Fiji Government Online Portal, 2011; Newcrest Mining Ltd., 2012).

Gold and Silver.—The Vatukoula gold mine, which was 100% owned by Vatukoula Gold Mines plc. (VGM), was the country's primary gold-and-silver-producing mine. The mine began production in 1933, closed in 2006, and was acquired by VGM and reopened in 2008. In 2011, VGM announced that the mine had mineral resources of about 131,000 kg (4,200,000 troy ounces) and mineral reserves of about 24,600 kg (790,000 troy ounces) of gold and silver. The company processed 498,123 metric tons of ore, produced 1,622 kg (52,157 troy ounces) of gold, and sold 1,663 kg (53,461 troy ounces) of gold in 2011 (Vatukoula Gold Mines plc., 2012, p. 3, 5, 18). In June, Dome Gold Mines Ltd. of Australia launched the company's initial public offering for its drilling projects in Fiji, which included the Nasivi Delta gold and magnetite project, the Kadavu gold project, and the Central Viti Levu copper project. Dome planned to drill at the Nasivi Delta and to begin a feasibility study by 2013 (Australia's Paydirt, 2012, p. 81).

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Outlook

Fiji's economy is expected to grow by about 2.2% in 2012, and the average annual inflation rate was expected to be less than 6%. The implementation of the Government's public capital projects is likely to create job opportunities and to support Fiji's economy. Because of the lower copper and gold prices and the slowdown of economic growth in China and the United States, foreign demand for copper and gold from Fiji is likely to remain at the current level. If gold trade in China and India markets increases, however, the gold mine output, exports, and recycling at the Vatukoula Mine are expected to increase. The Namosi Mine is expected to start up in the near future (ANZ Pacific Quarterly, 2012; Newcrest Mining Ltd., 2012; Vatukoula Gold Mines plc., 2012).

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TABLE 1
FIJI: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

Commodity[3]		2007	2008	2009	2010	2011
Cement, hydraulic	metric tons	145,000	143,000	110,000	120,000	120,000
Gold, mine output, Au content	kilograms	837	871	1,040	1,856 [4]	1,622 [4]
Limestone	metric tons	220,000	215,000	215,000	50,000	50,000
Sand and gravel	cubic meters	310,000	300,000	300,000	300,000	300,000
Silver, mine output, Ag content	kilograms	3	265 [4]	293	500	400

[1]Estimated data are rounded to no more than three significant digits.

[2]Table includes data available through July 27, 2012.

[3]In addition to the commodities listed, bauxite, crushed and dimension stone, coral sand, marble, and other construction materials are produced, but available data are insufficient to make reliable estimates of output.

[4]Reported figure.

TABLE 2
FIJI: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Cement		Fiji Industries Ltd. (FIL) (an affiliate company of Holcim Group)	Lami, Suva, Fiji	150
Gold	kilograms	Vatukoula Gold Mines plc., 100%	Vatukoula, on the island of Viti Levu	1,800
Silver	do.	do.	do.	500

[e]Estimated. do. Ditto.

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THE MINERAL INDUSTRY OF INDIA

By Chin S. Kuo

India has significant mineral resources. The country's reserves and resources of barite, bauxite, chromium, coal, iron ore, limestone, and manganese ore were among the 10 largest in the world. The country produced 10 metals, 47 industrial minerals, 23 minor minerals, 4 mineral fuels, and 3 atomic minerals. In terms of output, the country was among the world's eight leading producers of aluminum, barite, bauxite, chromium, coal, iron ore, kyanite, manganese ore, mica (sheet), steel, talc, and zinc (Ministry of Mines, 2012, p. 248–249).

In India, the per capita consumption of most metals, including aluminum, copper, lead, zinc, and related products, was one of the lowest in the world. In the next 15 years, however, the demand for metals and minerals is likely to increase by four to five times owing to the advancement of living standards. Because these raw materials are vital for infrastructure, capital goods, and basic industries, development of a sustainable mining industry was the Government's top priority.

Minerals in the National Economy

In 2011, the mineral sector's contribution to the gross domestic product was 2.63%, and this percentage was likely to increase to between 7% and 8% in the near future owing to increasing domestic demand for and therefore production of metals and minerals. Overall mineral production in terms of tonnage decreased by 0.75% in 2011, and the total value of mineral production decreased by 1.02%. Mineral fuels accounted for 68.22% of the total value; metals, 19.94%; and industrial minerals, 11.83%. In 2010 (the latest year for which data were available), the value of mineral exports increased by 29.14% and that of mineral imports increased by 27.47% compared with those of 2009 (Ministry of Mines, 2012, p. 19, 250–253).

Government Policies and Programs

The National Mineral Policy of 1993 was initiated to encourage private and foreign investment and to attract state-of-the-art technology in the mineral sector. The new National Mineral Policy of 2008 is designed to encourage large-scale prospecting to promote efficient mining and to attract investment and the latest technology. The Government issues reconnaissance permits, which allow a 3-year period for general studies; prospecting licenses, which allow specified drilling programs for a maximum period of 3 years; and mining leases, which allow operations for extracting minerals for a minimum period of 20 years and a maximum period of 30 years (Mining Journal, 2011a).

The Commission of Indian Ministers approved the draft Mines and Minerals Development and Regulation bill, which would require mining companies to pay 100% of the royalties in mining projects and 26% of the profits in coal projects to people displaced because of land acquisition. The bill would empower the mining companies to proceed promptly with acquiring land to develop their projects. Analysts said that the bill would serve as a disincentive to the mining sector and would also deter foreign investments. Major steel producers, including Jindal Steel & Power Ltd. and Tata Steel, also opposed the profit-sharing formula (Mineweb.com, 2011b).

The Government approved plans to set up the National Mining Regulatory Authority to investigate, regulate against, and police large-scale illegal mining activity, including illegal mining of bauxite, graphite, iron ore, magnesite, mineral sands, and talc. The move to clamp down on illegal mining could affect the domestic price and availability of these minerals (Lismore, 2011).

Production

In 2011, production of such mineral commodities as cobalt, mined copper, direct-reduced iron, primary lead, total lead, silver, and steel increased by more than 5% whereas output of cadmium, manganese concentrate, and mined zinc decreased by 2.5%, 11.1%, and 4.1%, respectively. The increase (by 60%) in the production of primary lead was owing to the debottlenecking of Hindustan Zinc Ltd.'s Chanderiya smelter to improve operational efficiency. As a result, output of primary zinc, secondary zinc, and total zinc also was estimated to have increased by 13.1%, 21.6%, and 13.6%, respectively. As for industrial minerals, production of barite, fluorspar concentrate, graded fluorspar, and sulfur was estimated to have increased slightly by a revised 3.9%, 1.2%, 4.3%, and 1.7%, respectively (table 1).

Structure of the Mineral Industry

India's mineral sector includes mining and mineral processing industries, which are the backbone of the country's industrial production. The mineral sector provides the basic raw materials to the manufacturing sector. India's mining industry was characterized by a large number of small operating mines. Small mines in the private sector continued to be operated either as proprietary or partnership ventures. Public sector undertakings under the Ministry of Mines were Hindustan Copper Ltd. (HCL), Mineral Exploration Corp. Ltd., and National Aluminium Co. Ltd. (Nalco). The public sector companies accounted for 66.5% of the total value of mineral production. The number of mines that reported mineral production was 2,649 in 2011 and included 1,523 industrial mines, 553 metal mines, and 573 coal mines. Production from opencast mines accounted for 80% of the total mine output. The number of underground operations was in decline. Total employment in the mineral industry was estimated to be more than 500,000 (table 2).

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Mineral Trade

The total value of exports of ores and minerals was about $27.6 billion in 2010 (the latest year for which data were available). Diamond (mostly cut and polished) was the principal item of export, accounting for 71.3% of all mineral and ore exports; iron ore, 13.0%; alumina, 5.6%; and granite, 3.3%. The total value of imports of ores, minerals, and fuels was about $113 billion. Crude petroleum was the main component of these imports, accounting for 63.0%; diamond (rough), 22.8%; coal, 6.2%; copper ore and concentrate, 3.0%; and natural gas, 2.2% (Ministry of Mines, 2012, p. 250–253).

The country continued to be largely self-sufficient in such mineral commodities as bauxite, chromite, ilmenite, iron ore, manganese ore, and rutile, among metals; and barite, dolomite, feldspar, limestone, silica minerals, sillimanite, and talc, among industrial minerals (Ministry of Mines, 2012, p. 24).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—Vedanta Aluminium Ltd. decided to move ahead with the expansion of its aluminum smelter at Jharsuguda in the State of Odisha (formerly Orissa) to achieve its targeted capacity of 1.75 million metric tons per year (Mt/yr) in 2013 from the current 500,000 metric tons per year (t/yr). Expansion of its 1-Mt/yr alumina refinery at Lanjigarh, which is also located in Odisha, to 5 Mt/yr was on hold, however. The expansion of the alumina refinery was awaiting the clearance of the Ministry of Environment (Economic Times, The, 2011).

Ashapura Minechem Ltd. was India's leading producer of calcined bauxite; it had a production capacity of 100,000 t/yr. The majority of the company's output was consumed by domestic refractory companies, and a portion was sold to the abrasive markets. Gujarat Mineral Development Corp. Ltd. produced 50,000 t/yr of calcined bauxite from its Gadhshisha facilities for the abrasive and refractory markets (Roberts, 2011).

Copper.—The Government approved HCL's $375 million investment to develop an underground copper mine at the company's Malanjkhand copper project in the State of Madhya Pradesh. The project would increase the mine's production capacity to 5 Mt/yr from the current 2 Mt/yr, which was mined by open pit. The open pit extended to a depth of 340 meters (m) and had a remaining life of 7 years. The copper deposit represented 70% of India's copper reserves (Mining Journal, 2011b).

Ferroalloys.—Glencore International plc of Switzerland planned to buy 24% of Cronimet Alloys India Ltd., which owned a 25,000-t/yr ferrochrome plant in the Srikakulam District in the State of Andhra Pradesh. Cronimet also was building a 165,000-t/yr high-carbon ferrochrome plant at Kolathapangi in the State of Odisha, which contained 98% of India's chrome ore reserves. Orissa Mining Corp. supplied chromite to most ferrochrome producers in the country. The Government sought to ban chromite exports, and the ferrochrome industry campaigned for removal of the 2.5% duty on imports of chromite (Metal Bulletin, 2011).

Iron Ore and Iron and Steel.—India exported 100 Mt/yr of iron ore to China, and, along with Australia and Brazil, was one of the world's three leading iron ore exporters. To conserve the iron ore resource for domestic steel producers, the Government sought to curb exports (which went mostly to China) and planned to increase the duty on iron ore fines to 20% from 5% and on iron ore lumps to 20% from 15% (Reuters, 2011).

Platinum-Group Metals.—The Geological Survey of India and Orissa Mining discovered a platinum-group metals (PGM) deposit in the Baula-Nuasahi complex near the active chromite mines in the State of Odisha. Orissa Mining produced chromite from mines at Bangur in the Keonjhar District. The deposit had proven reserves of 14.2 million metric tons and contained platinum, palladium, iridium, rhodium, osmium, and ruthenium (Mineweb.com, 2011c).

Titanium and Zirconium Mineral Concentrates (Mineral Sands).—Trimex Group's planned $155 million expansion of its mineral sands mine in the Srikakulam District in the State of Andhra Pradesh was met by opposition from local residents. The company planned to expand the operations to an additional area of 18 square kilometers where there were cashew nut and coconut plantations. The mine had capacities of 200,000 t/yr of ilmenite, 60,000 t/yr of garnet, 50,000 t/yr of sillimanite, 6,000 t/yr of rutile, and 6,000 t/yr of zircon, (Watts, 2011b).

Nalco entered into an agreement with Indian Rare Earths Ltd. to develop the country's first titanium dioxide operations with an investment of $88 million at Chhatrapur in the State of Odisha. VV Mineral Ltd. agreed to buy Kilburn Chemicals Ltd.'s titanium dioxide plant at Tuticorin in the State of Tamil Nadu. VV Mineral, which was India's leading producer of ilmenite, had a production capacity of 450,000 t/yr (O'Driscoll, 2011b).

Industrial Minerals

Barite.—ICL Ltd. increased its barite production capacity to 300,000 t/yr in anticipation of strong demand. A boom (an 18% increase) in oil and gas exploration globally was expected to increase barite prices. Indian barite remained in strong demand throughout the Middle East and in the United States. The market volume in Saudi Arabia for barite increased to 350,000 t/yr from 120,000 t/yr in 2010 (Elliott, 2011).

Bromine.—Chemtura Corp. of the United States planned to establish a strategic alliance with Archean Group in the production of bromine and brominated derivatives. Archean's marine chemical plant in the Rann of Kutch in the State of Gujarat was scheduled to come online in 2012 and would produce bromine, gypsum, and potassium sulfate. The $250 million plant was expected to produce 100,000 t/yr of potassium sulfate and 2 Mt/yr of salt. Archean was also active in the production of other industrial minerals in India (O'Driscoll, 2011a).

Cement.—In the past 3 to 4 years, India added more than 100 Mt/yr of cement production capacity for a total capacity of 300 Mt/yr as of 2010. Cement output was expected to increase to 320 Mt/yr by the end of 2011. Cement consumption was about 80% of production capacity and was projected to increase by between 8% and 9% per year. The housing sector consumed about 65% of the total output (CemWeek, 2011).

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India Cements Co. Ltd. started its Mahi cement plant with a production capacity of 1.5 Mt/yr in the State of Rajasthan, thus increasing the company's installed capacity to 16 Mt/yr. The plant would supply cement to the States of Gujarat, Madhya Pradesh, and Rajasthan (International Cement Research, 2011b).

Associated Cement Cos. Ltd.'s (ACC's) total capacity of cement increased to 30 Mt/yr from 22 Mt/yr in 2010 with the $183 million expansions completed at Wadi [12,500-metric-ton-per-day (t/d) kiln] in the State of Karnataka and at Chanda (7,000-t/d clinker) in the State of Maharashtra. The company was expected to reach 11% of market share in India. Holcim Ltd. of Switzerland increased its stake in ACC to 50.1% through open-market purchases (International Cement Research, 2011a).

Rain Commodities Ltd. acquired Birla Cement Ltd. from the Yash Birla Group. Rain Commodities manufactured and sold cement in the States of Andhra Pradesh, Karnataka, and Tamil Nadu. In addition, the company was involved in the manufacturing and trading of calcined petroleum coke (Aggregate Research, 2011b).

Kishan Group was to increase its cement output capacity by investing $63 million to set up a new 900,000-t/yr cement plant, which was expected to be commissioned in December 2011. The company operated a mini cement plant with a capacity of 200,000 t/yr. The market area focused on the States of Gujarat, Maharashtra, and Rajasthan (Global Cement Weekly, 2011).

Prism Cement Ltd. was granted 405 hectares (ha) of land by the State government of Andhra Pradesh to build a 9.3-Mt/yr cement plant in the Kumool District. The project was expected to be completed in two phases within the next 3 years. The company held a mining lease of 243 ha of limestone reserves. The State had rich limestone reserves and an installed cement production capacity of 40 Mt/yr, but consumed only 20 Mt/yr of cement. The company operated a 3-Mt/yr cement plant at Satna in the State of Madhya Pradesh and planned to expand its production capacity (Aggregate Research, 2011a).

Ultra Tech Cement Ltd. planned to set up a cement plant at Dankuni in the Hoogly District in the State of West Bengal with a capacity of 2 Mt/yr. The plant would produce 6,000 t/d of portland cement and procure the clinker from the company's other plants to grind and blend with fly ash and gypsum. The plant was expected to consume 4,000 to 4,500 t/d of clinker, 1,350 to 1,900 t/d of fly ash, and 280 to 350 t/d of gypsum. The company was expected to reach a total capacity of 9 Mt/yr of cement with clinker plants and grinding units in 2014 (Aggregate Research, 2011c).

Diamond.—The slowdown in demand for diamond from Belgium, the United Arab Emirates, and the United States had not affected the diamond trade in Surat in the State of Gujarat, which was Asia's leading diamond polishing hub. These two markets still accounted for a large quantity of the diamond (cut and polished) exports from India. The Asian market increased its contribution to the diamond trade and received more than 25% of exports. Hong Kong accounted for the highest export volume of India's cut and polished diamond, followed by Thailand, Japan, Singapore, the Republic of Korea, Malaysia, and Nepal (Business Standard, 2011a).

Limestone.—Bisra Stone Lime Co. Ltd. stopped production of limestone and dolomite at Birmitrapur in the Sundargarh District in the State of Odisha owing to environmental concerns from the State Pollution Control Board. The environmental clearance for the 18,000-metric-ton-per-month mining operation expired in March without being renewed. As a result, the company had difficulties in supplying raw materials to Steel Authority of India Ltd. and Neelachal Ispat Nigam Ltd. Operations of limestone were halted at some quarries in Piduguralla in the neighboring State of Andhra Pradesh (Feytis, 2011).

Lithium.—Rockwood Holdings Inc.'s subsidiary Chemetall Lithium India Pvt. Ltd. opened a new plant in the Dahei Special Economic Zone in the State of Gujarat to produce the lithium derivative butylithium and supply lithium products to India and the other South Asian markets. Butylithium was used as an initiator for anionic polymerization and as a base in organic, pharmaceutical, and agrochemical syntheses. Chemetall Lithium produced lithium raw materials from its brine operation at Salar de Atacama in Chile (Watts, 2011a).

Refractory Materials.—Tata Steel sold a 51% stake in Tata Refractories Ltd. to Krosaki Harima Corp. (in which Nippon Steel Corp. of Japan owned a 42.9% interest) and still retained a 26.46% interest. Tata Refractories was India's leading refractories manufacturer; it had a production capacity of 340,000 t/yr and was located at Belpahar in the State of Odisha. The company met the requirements of such industries as cement, glass, nonferrous metals, petrochemicals, and steel producers. Krosaki Harima was a leading global refractories maker (Business Standard, 2011b).

Wollastonite.—Wolkem India Ltd., which was India's leading wollastonite producer, planned to increase its total wollastonite production from a deposit near Ajmer in the State of Rajasthan by 30,000 t/yr to meet demand expected in fiscal year 2014. Domestic markets for wollastonite increased owing to growing demand in ceramic, friction, and plastic applications. The company also produced wollastonite from the Sirohi District in the State of Rajasthan from a mine with a capacity of 175,000 t/yr (Industrial Minerals, 2011).

Mineral Fuels and Related Materials

Coal.—A total of 58 coal blocks with more than 18.6 billion metric tons (Gt) of reserves was put on auction in the first round of competitive bidding in October 2011. The blocks were in the coal belt that spans seven States. Some large blocks included the Deocha-Pachami in the State of West Bengal (with reserves of 2 Gt), the Tentuloi in the State of Odisha (1.2 Gt), the Badam Dip Side and the Dip Side of Rhone-Rautpara in the State of Jharkhand (1 to 1.5 Gt each) (Singh, 2011).

NTPC Ltd. planned to start coal production from its Pakri Barwadih coal mining project in 2012, and the rate of production would be 15 Mt/yr after completion of the project. Coal produced from the mine would be transported for a distance of 13 kilometers (km) to a coal and rail yard at Banadag in the Hazaribagh District in the State of Jharkhand through an elevated conveyer system. Coal would be fed to various thermal power projects operated by the company (PSU India, 2011).

Natural Gas.—India's annual natural gas production was projected to increase to 65 billion cubic meters by 2015 from

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50 billion cubic meters in 2011, and annual consumption was projected to reach 85 billion cubic meters by 2015. For supply and consumption to expand rapidly, the Government planned to shift to market pricing to encourage domestic production, extend pipeline infrastructure to southern India, and build more liquefied natural gas (LNG) terminals. The increase in natural gas use was expected to displace 100,000 barrels per day (bbl/d) of naphtha demand and would have a significant effect on coal use in the country. Naphtha was used mainly by the fertilizer and power industries (Oil & Gas Journal, 2011c).

The State government of Gujarat approved the construction of a $1 billion 5-Mt/yr LNG import terminal at Munda. The project was a joint venture between Gujarat State Petroleum Corp. and Adani Group (Petroleum Economist, 2011).

Oil and Natural Gas Corp. discovered shale gas near Durgapur in the State of West Bengal. Gas flowed out from the Barren Measure shale at a depth of 1,700 m in the well of RNSG-1 in January 2011. India was the first country outside the United States and Canada to find gas in shale (Rigzone.com, 2011).

Petroleum.—Construction was underway and was expected to be completed in the first quarter of 2013 on the 300,000-bbl/d oil refinery to be operated by Indian Oil Corp. at Paradip in the State of Odisha. The company controlled 10 of India's 20 oil refineries. The major refineries, in terms of capacity, were at Mathura in the State of Uttar Pradesh and at Panipat in the State of Haryana (Oil & Gas Journal, 2011b).

Commissioning of the 180,000-bbl/d Guru Gobind Singh oil refinery at Bathinda in the State of Punjab was delayed until 2012. Hindustan Petroleum Corp. Ltd. built the refinery in a joint venture with Mittal Energy Investment Pte. Ltd. of Singapore. The refinery's crude distillation and vacuum distillation units and a single-point mooring system and terminal at Mundra in the State of Gujarat were completed. A 1,014-km pipeline to carry crude oil from Mundra to Bathinda was operational (Oil & Gas Journal, 2011a).

Uranium.—India's Department of Atomic Energy confirmed the presence of 49,000 metric tons (t) of uranium in the mines of Tummalapalle in the Cuddapah District of Andhra Pradesh State. The mines were operated by Uranium Corp. of India Ltd. Reserves were estimated to be as large as 150,000 t. The country had total reserves of 175,000 t of uranium and an operating mine at Jaduguda in the State of Jharkhand. Yet, India still imported uranium to meet the demand of its nuclear program. The country imported 300 t of uranium from France in 2010 and entered into a pact with Russia for the supply of 2,000 t of uranium and with Kazakhstan for 2,100 t in 2011. India had 20 nuclear powerplants with a total capacity of 4,780 megawatts (MW) in operation and 7 more with a combined capacity of 5,300 MW under construction (Mineweb.com, 2011a).

Reserves and Resources

The country's mineral resources include large deposits of barite, bauxite, chromium, coal, iron ore, limestone, and manganese. Barite deposits occur in the State of Andhra Pradesh. Bauxite resources are found in the States of Andhra Pradesh, Chhattisgarh, Gujarat, and Odisha. Iron ore deposits in the form of hematite and magnetite occur in the States of Bihar, Karnataka, Madhya Pradesh, Odisha, and Tamil Nadu. India's coal resources amounted to 267 Gt and are located in the States of Andhra Pradesh, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, and West Bengal. Its lignite reserves totaled 39 Gt and are found in the States of Gujarat, Jammu and Kashmir, Kerala, Rajasthan, and Tamil Nadu (table 3).

Outlook

India is expected to continue to be largely self-sufficient in minerals and metals that constitute the primary raw materials for its various industries. The Government's approval of the Mines and Minerals Development and Regulation bill is expected to facilitate the process of land acquisition for mining projects. Production of alumina and aluminum is expected to increase when Vedanta's expanded alumina refinery and new aluminum smelter are completed in 2013. Despite the increase in export duties, India is expected to continue to export iron ore to China but in lesser amounts. Strong demand for barite in the global oil and gas industry is expected to lead to increased production in India to supply barite to the Middle East and the United States. Cement consumption in India is expected to increase and so is the country's total production capacity. The country is, by and large, self-sufficient in coal and lignite. By 2015, India's consumption of natural gas is expected to exceed its domestic production. Imports of LNG are expected to gradually increase as development of the LNG terminals and the pipeline infrastructure progresses.

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TABLE 1
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
METALS						
Aluminum:						
Bauxite, gross weight[4]	thousand metric tons	8,300 r	10,100 r	10,300 r	9,900 r	10,300
Alumina, Al_2O_3 equivalent	do.	3,000 r	3,820 r	3,900 r	3,640 r	3,880
Metal, primary[4]		1,028,000 r	1,402,000 r	1,598,000 r	1,607,000 r	1,667,000
Cadmium metal[4]		580	599	627 r	632 r	616
Chromium, chromite, gross weight		3,320,000 4	3,900,000 4	3,760,000 4	3,800,000	3,850,000
Cobalt metal[4]		980	858	1,001	670 r	720
Copper:						
Mine output, Cu content[4]		33,900	30,600	29,500	35,500 r	37,700
Metal, primary:						
Smelter		700,000 4	651,000 4	705,100 4	748,800 r, 4	750,000
Refinery:						
Electrolytic, cathode[4]		698,600	654,200	705,100	654,900 r	671,100
Fire refined		15,000	15,000	10,000	9,000	2,000
Total		714,000	669,000	715,000	664,000 r	673,000
Gold metal, smelter	kilograms	3,000 4	2,700 4	2,800	2,700	2,300
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand metric tons	207,000 4	215,000 4	225,000 4	230,000	240,000
Fe content	do.	126,000 4	138,000 4	144,000 4	147,000	154,000
Metal:						
Pig iron[4]	do.	28,800	29,000	34,000	38,685	38,900
Direct-reduced iron[4]	do.	19,060	21,200	22,030	23,420	27,560
Ferroalloys:						
Ferrochromium, including charge chrome		820,000 4	750,000 4	873,385 4	850,000	830,000
Ferrochromiumsilicon		10,000	10,000	10,000	10,000	10,000
Ferromanganese		391,210 4	384,577 4	389,465 4	413,000	420,000
Ferrosilicon		80,000	92,000	101,337 4	101,000	105,000
Silicomanganese		911,402 4	891,458 4	1,099,838 4	1,170,000	1,200,000
Other		9,000	9,000	9,000	9,000	9,000
Steel, crude[4]	thousand metric tons	53,500	57,800	63,500	68,300	72,200
Semimanufactures[5]	do.	47,000	49,000	50,000	51,000	53,000
Lead:						
Mine output, Pb content		77,500 4	87,300 4	92,000	97,000 r	115,000
Metal, refined:[4]						
Primary		53,800	62,000	61,700 r	75,000 r	120,000
Secondary		205,000 r	232,000 r	275,000 r	305,000 r	306,000
Total		258,800 r	294,000 r	336,700 r	380,000 r	426,000
Manganese:						
Ore and concentrate, gross weight[4]	thousand metric tons	2,016 r	2,293 r	2,374 r	2,858 r	2,542
Mn content	do.	810 r	920 r	950 r	1,140 r	1,020
Selenium	kilograms	14,000	14,000	15,000	15,000	16,000
Silver, mine and smelter output[4]	do.	82,300	96,000	138,100 r	165,100 r	203,500
Titanium mineral concentrates, gross weight:						
Ilmenite		700,000	610,000	700,000	540,000	550,000
Rutile		21,000	21,000	21,000	24,000	25,000
Zinc:						
Mine output, concentrate:						
Gross weight		925,000 r	1,120,000 r	1,260,000 r	1,400,000 r	1,350,000
Zn content[4]		538,900 r	613,600 r	695,000 r	740,000 r	710,000

See footnotes at end of table.

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TABLE 1—Continued
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
METALS—Continued						
Zinc—Continued:						
Metal:						
Primary		430,800 [4]	545,800 [4]	584,100 [r, 4]	663,300 [r, 4]	750,000
Secondary		23,000	22,000	30,000 [r]	37,000 [r]	45,000
Total		454,000	568,000	614,000 [r]	700,000 [r]	795,000
Zirconium concentrate, zircon, gross weight		29,000	30,000	37,000	38,000	39,000
INDUSTRIAL MINERALS						
Abrasives, natural, n.e.s.:[6]						
Corundum, natural	kilograms	1,000	1,000	1,000	1,000	1,000
Garnet		120,000	125,000	127,000	130,000	133,000
Jasper		9,000	8,900	8,700	8,800	8,900
Asbestos		21,000	20,000	19,000	20,000	19,000
Barite		1,000,000	1,100,000	1,200,000	1,300,000 [r]	1,350,000
Bromine, elemental		1,500	1,500	1,500	1,500	1,500
Cement, hydraulic	thousand metric tons	170,000	185,000	205,000	220,000	270,000
Chalk		125,000	125,000	125,000	130,000	130,000
Clays:						
Ball clay		430,000	430,000	440,000	440,000	450,000
Diaspore		10,000	10,000	10,000	10,000	10,000
Fire clay		380,000	390,000	395,000	400,000	410,000
Kaolin:						
Salable crude	thousand metric tons	570	570	580	580	600
Processed	do.	200	210	210	220	220
Total	do.	770	780	790	800	820
Other	do.	85	85	85	90	90
Diamond:						
Gem	thousand carats	15	15	14	13	12
Industrial	do.	40	38	38	37	36
Total	do.	55	53	52	50	48
Feldspar		486,272 [4]	385,436 [4]	390,000	400,000	420,000
Fluorspar:						
Concentrates, metallurgical grade		5,000	6,059 [r, 4]	8,293 [r, 4]	8,400 [r]	8,500
Other fluorspar materials, graded		1,000	3,375 [r, 4]	4,541 [r, 4]	4,600 [r]	4,800
Gemstones, excluding diamond:						
Agate, including chalcedony pebble		170	160	160	150	150
Garnet	kilograms	800	800	800	800	800
Graphite[7]		130,000	140,000	130,000	140,000	150,000
Gypsum		2,500,000	2,550,000	2,600,000	2,650,000	2,700,000
Kyanite and related materials:						
Kyanite		7,300	7,500	7,700	7,800	8,000
Sillimanite		15,200	16,000	16,500	16,800	17,000
Lime	thousand metric tons	12,000	13,000	13,000	14,000	15,000
Magnesite		360,000	350,000	340,000	345,000	350,000
Mica:						
Crude		3,786 [4]	2,049 [4]	2,000	2,100	2,400
Scrap and waste		3,421 [4]	4,470 [4]	4,500	4,700	4,900
Total		7,207 [4]	6,519 [4]	6,500	6,800	7,300
Nitrogen, N content of ammonia	thousand metric tons	11,000	11,100	11,200	11,500	11,800
Phosphate rock, including apatite		1,210,000	1,220,000	1,230,000	1,240,000	1,250,000
Pigments, mineral, natural, ocher		375,000	380,000	385,000	390,000	395,000
Pyrites, gross weight		120,000	120,000	115,000	115,000	110,000

See footnotes at end of table.

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TABLE 1—Continued
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
INDUSTRIAL MINERALS—Continued						
Rare-earth metals, monazite concentrate, gross weight		5,000	5,000	5,000	5,200	5,200
Salt:						
Rock salt	thousand metric tons	3	3	3	3	2
Other	do.	16,000	16,000	16,500	17,000	16,000
Total	do.	16,000	16,000	16,500	17,000	16,000
Sand:						
Calcareous	do.	270	275	280	285	290
Silica	do.	1,600	1,700	1,700	1,800	1,800
Other	do.	3,100	3,200	3,300	3,400	3,500
Slate		13,000	13,500	14,000	14,500	15,000
Soda ash		1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Stone, sand and gravel:						
Calcite		54,000	55,000	55,000	56,000	56,000
Dolomite	thousand metric tons	3,100	3,100	3,100	3,200	3,200
Limestone	do.	125,000	127,000	130,000	132,000	135,000
Quartz and quartzite	do.	280	280	280	290	290
Sulfur, byproduct from fertilizer plants	do.	590 r	600 r	590 r	600 r	610
Talc and related materials:						
Pyrophyllite		87,000	87,000	88,000	90,000	90,000
Steatite, soapstone		555,000	560,000	550,000	550,000	560,000
Vermiculite		9,639 [4]	11,742 [4]	12,000	12,000	13,000
Wollastonite		120,000	125,000	135,000	145,000	150,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	thousand metric tons	380,000	420,000	450,000	480,000	500,000
Lignite	do.	25,000	26,000	25,000	27,000	28,000
Total	do.	405,000	446,000	475,000	507,000	528,000
Gas, natural:						
Gross	million cubic meters	32,407 [4]	33,061 [4]	35,000	37,000	38,000
Marketable	do.	27,069 [4]	27,457 [4]	30,000	32,000	33,000
Petroleum:						
Crude	thousand 42-gallon barrels	254,000 [4]	253,000 [4]	255,000	260,000	265,000
Refinery products:						
Liquefied petroleum gas	do.	49,000 [4]	53,000 [4]	55,000	58,000	60,000
Gasoline	do.	101,000 [4]	119,000 [4]	125,000	130,000	135,000
Kerosene and jet fuel	do.	127,000 [4]	122,000 [4]	120,000	125,000	130,000
Distillate fuel oil	do.	432,000 [4]	468,000 [4]	480,000	490,000	500,000
Residual fuel oil	do.	117,000 [4]	130,000 [4]	140,000	145,000	150,000
Other	do.	330,000 [4]	319,000 [4]	315,000	310,000	300,000
Total	do.	1,156,000 [4]	1,211,000 [4]	1,240,000	1,260,000	1,275,000

rRevised. do. Ditto.

[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through October 15, 2012.

[3]In addition to the commodities listed, boron, other gemstones (aquamarine, emerald, ruby, and spinel), and uranium are produced, but output is not reported, and available information is inadequate to make reliable estimates of output.

[4]Reported figure.

[5]Excludes production from steel miniplants.

[6]Not elsewhere specified.

[7]India's marketable production is 10% to 20% of mine production.

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TABLE 2
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Alumina	Indian Aluminium Co. Ltd. (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	Belgaum refinery, Karnataka	280
Do.	National Aluminium Co. Ltd. (Government, 100%)	Dhamanjodi refinery, Odisha[1]	1,580
Do.	Bharat Aluminium Co. Ltd. [Government, 49%, and Sterlite Industries (India) Ltd., 51%]	Korba refinery, Chhattisgarh	200
Do.	Utkal Alumina International Ltd. (Hindalco Industries Ltd., 100%)	Koraput refinery, Odisha[1]	1,500 [2]
Do.	Madras Aluminium Co. Ltd. [Sterlite Industries (India) Ltd., 80%, and others, 20%]	Mettur refinery, Tamil Nadu	80
Do.	Indian Aluminium Co. Ltd. (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	Muri refinery, Jharkhand	88
Do.	Hindalco Industries Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Renukoot refinery, Uttar Pradesh	450
Aluminum	Indian Aluminium Co. Ltd. (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	Alupuram smelter, Kerala	20
Do.	Vedanta Aluminium Ltd.	Jharsuguda, Odisha[1]	500
Do.	National Aluminium Co. Ltd. (Government, 100%)	Angul smelter, Odisha[1]	345
Do.	Indian Aluminium Co. Ltd. (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	Belgaum smelter, Karnataka	70
Do.	Hindalco Industries Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Hirakud smelter, Odisha[1]	100
Do.	Bharat Aluminium Co. Ltd. [Government, 49%, and Sterlite Industries (India) Ltd., 51%]	Korba smelter, Chhattisgarh	350
Do.	Madras Aluminium Co. Ltd. [Sterlite Industries (India) Ltd., 80%, and others, 20%]	Mettur smelter, Tamil Nadu	40
Do.	Hindalco Industries Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Renukoot smelter, Uttar Pradesh	275
Barite	Andhra Pradesh Mineral Development Corp. Ltd. (Andhra Pradesh State government, 100%)	Cuddapah District mines, Andhra Pradesh	350
Do.	ICL Ltd.	do.	300
Do.	Associated Mineral Corp.	do.	75
Do.	Pragathi Minerals	do.	50
Do.	Shri C.M. Ram nath Reddy	do.	75
Do.	Vijayalaxmi Minerals Trading Co.	do.	50
Bauxite	Bharat Aluminium Co. Ltd. [Government, 49%, and Sterlite Industries (India) Ltd., 51%]	Amarkantak Mine, Madhya Pradesh	200
Do.	Indian Aluminium Co. Ltd. (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	Kolhapur District mines, Maharashtra	600
Do.	Gujarat Mineral Development Corp. (Gujarat State government, 100%)	Kutch and Saurashtra Mines, Gujarat	500
Do.	Hindalco Aluminium Co. Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Mines in Lohardaga District, Jharkhand	750
Do.	Indian Aluminium Co. Ltd. (Indian interests, 60.4%, and Alcan Aluminium Ltd., 39.6%)	do.	200
Do.	National Aluminium Co. Ltd. (Government, 100%)	Mines in Panchpatmali Hills, Koraput District, Odisha[1]	4,800
Do.	Minerals & Minerals Ltd. (Government, 100%)	Mines in Richuguta, Palamau District, Jharkhand	200
Boron	Borax Morarji Ltd.	Ambernath, Maharashtra	17
Cement	Larsen and Toubro Ltd.	Awarpur Plant, Maharashtra	2,300
Do.	Century Cement [Century Textiles and Industries Ltd. (a subsidiary of the Birla Group, 100%)]	Baikunth Plant, Madhya Pradesh	1,120
Do.	Ambuja Cements Ltd. (Holcim Group, 14.8%)	Plants in 7 States	25,000

See footnotes at end of table.

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TABLE 2—Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Cement—Continued	Coromandel Fertilizers Ltd. [Chevron Chemical Co., 23.55%; International Minerals and Chemical Co., 20.89%; Parry and Co., 10.64%; E.I.D. Parry (India) Ltd., 6.65%; others, 38.27%]	Chilamkur plant, Andhra Pradesh	1,000
Do.	Dalmia Bharat Enterprises Ltd.	Dalmiapuram and Ariyalur, Tamil Nadu; and Kadapa, Andhra Pradesh	9,000
Do.	Associated Cement Cos. Ltd. (ACC) (Government, 34.86%; Holcim Ltd., 46%; and private shareholders, 19.14%)	Gagal plant, Himachal Pradesh	1,830
Do.	do.	Chanda plant, Maharashtra	2,520
Do.	Raymond Cement Works (a division of Raymond Woolen Mills Ltd., JK Singhania, principal shareholder)	Gopalnagar plant, West Bengal	1,250
Do.	Shree Cement Ltd.	Haridwar plant, Uttarakhand	1,800
Do.	Rajashree Cement (a division of Indian Rayon and Industries Ltd., 100%)	Khor plant, Karnataka	1,020
Do.	Associated Cement Cos. Ltd. (ACC) (Government, 34.86%; Holcim Ltd., 50.1%; and private shareholders, 15.04%)	Kymore plant, Madhya Pradesh	1,500
Do.	My Home Industries Ltd. (joint venture of My Home Group and CRH plc)	Mellacheruvu and Visakhapatnam in Andhra Pradesh	4,600
Do.	HeidelbergCement India Ltd.	Narasingarh plant, Haryana	1,090
Do.	Cement Corp. of India Ltd. (Government, 100%)	Nayagaon plant, Madhya Pradesh	1,330
Do.	JK Cement Works (a division of JK Synthetics Ltd.), 100%	Nimbahera plant, Rajasthan	1,460
Do.	OCL India Ltd.	Odisha[1]	1,850
Do.	India Cements Co. Ltd. (Government, 26%; Life Insurance Corp. of India, 24%; others, 50%)	Sankarnagar plant and 2 plants, Tamil Nadu; four plants, Andhra Pradesh; Mahi plant, Rajasthan	16,000
Do.	Prism Cement Ltd.	Satna plant, Madhya Pradesh	3,000
Do.	Jaiprakash Associates Ltd.	Sewagram, Gujarat	2,400
Do.	Shree Digvijay Cement Co. Ltd.	Shreeniwas plant, Maharashtra	1,070
Do.	JK Lakshmi Cement Ltd. (a division of Straw Products Ltd., JK Singhania, principal shareholder)	Sirohi plant, Rajasthan and Ahmadabad, Gujarat	4,700
Do.	Lafarge S.A.	Sonadih, Chhattisgarh	1,400
Do.	Manikgarth Cement [Century Textiles and Industries Ltd. (a subsidiary of the Birla Group, 100%)]	Tehsil Rajura plant, Maharashtra	1,000
Do.	Vikram Cement [Grasim Industries Ltd. (a subsidiary of the Birla Group, 100%)]	Vikram plant, Madhya Pradesh	1,000
Do.	Raasi Cement Ltd. (Andhra Pradesh State government, 50%, and Development Co. Ltd., 50%)	Vishnupuram plant, Andhra Pradesh	1,000
Do.	Associated Cement Cos. Ltd. (ACC) (Government, 34.86%; Holcim Ltd., 46%; and private shareholders, 19.14%)	Wadi plant, Karnataka	6,680
Chromium	Ferro Alloys Corp. Ltd.	Cuttack District, Odisha[1]	120
Do.	Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	do.	300
Do.	Tata Steel	do.	100
Do.	Ferro Alloys Corp. Ltd.	Dhenkanal and Kendujhar District, Odisha[1]	150
Do.	Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	do.	200
Do.	Mysore Minerals Ltd.	Hassan District, Karnataka	125
Do.	Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	do.	100
Do.	Ferro Alloys Corp. Ltd.	Khammam District, Andhra Pradesh	100
Coal, bituminous million metric tons	Bharat Coking Coal Ltd. (a subsidiary of Government-owned Coal India Ltd., 100%)	Bihar and West Bengal	26
Do. do.	Central Coalfields Ltd. (a subsidiary of Government-owned Coal India Ltd.), 100%	Bihar	27

See footnotes at end of table.

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TABLE 2—Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Coal, bituminous— Continued	million metric tons	Eastern Coalfields Ltd. (a subsidiary of Government-owned Coal India Ltd.), 100%	Bihar and West Bengal	21
Do.	do.	Mahanadi Coalfields Ltd. (a subsidiary of Government-owned Coal India Ltd.), 100%	Odisha[1]	21
Do.	do.	North Eastern Coalfields Ltd. (a subsidiary of Government-owned Coal India Ltd.), 100%	Assam	640
Do.	do.	Northern Coalfields Ltd. (a subsidiary of Government-owned Coal India Ltd.), 100%	Madhya Pradesh and Uttar Pradesh	24
Do.	do.	Singareni Collieries Co. Ltd. (Andhra Pradesh State government, 50%, and Government, 50%)	Andhra Pradesh	18
Do.	do.	South Eastern Coalfields Ltd. (a subsidiary of Government-owned Coal India Ltd.), 100%	Madhya Pradesh	36
Do.	do.	Western Coalfields Ltd. (a subsidiary of Government-owned Coal India Ltd.), 100%	Madhya Pradesh and Maharashtra	18
Coal, lignite	do.	Neyveli Lignite Corp. Ltd. (NLC) (Government, 100%)	Tamil Nadu	17
Copper, mine		Hindustan Copper Ltd. (HCL) (Government, 100%)	Indian Copper Complex Mines, Ghatsila District, Jharkhand	31
Do.		do.	Khetri Copper Complex Mines, Khetrinagar Rajasthan	15
Do.		do.	Malanjkhand Copper Complex Mines, Balaghar District, Madhya Pradesh	2,000
Copper, metal		Hindalco Industries Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Birla Copper Complex smelter, Dahej, Gujarat	70
Do.		Hindustan Copper Ltd. (HCL) (Government, 100%)	Indian Copper Complex smelter-refinery, Ghatsila District, Jharkhand	20
Do.		do.	Khetri Copper Complex smelter-refinery, Khetrinagar District, Rajasthan	45
Do.		Sterlite Industries (India) Ltd.	Tuticorin smelter, Tamil Nadu	400
Do.		do.	Silvassa refinery, Gujarat	300
Do.		Jhagadis Copper Ltd.	Jhagadia, Gujarat	50
Diamond	carats	National Mineral Development Corp. Ltd. (NMDC) (Government, 100%)	Mahjgawan Mine	25,000
Gold	kilograms	Hutti Gold Mines Co.	Hutti Mine, Karnataka	3,000
Graphite		Agrawal Graphite Industries Ltd.	Belpara District, Odisha[1]	10
Iron and steel, crude steel		Visvesvaraya Iron and Steel Ltd. (Karnataka State government, 60%, and Government-owned Steel Authority of India Ltd., 40%)	Bhadravati steel plant, Karnataka	180
Do.		Steel Authority of India Ltd. (Government, 100%)	Bhilai steel plant, Jharkhand	4,930
Do.		do.	Bokaro steel plant, Jharkhand	4,600
Do.		Indian Iron and Steel Co. Ltd. (a wholly owned subsidiary of Government-owned Steel Authority of India Ltd.), 100%	Burnpur steel plant, West Bengal	1,500
Do.		Ispat Industries Ltd.	Dolvi, Maharashtra	3,000
Do.		Steel Authority of India Ltd. (Government, 100%)	Durgapur steel plant, West Bengal	1,600
Do.		Tata Steel Ltd.	Jamshedpur steel plant, Jharkhand	6,800
Do.		do.	Jagdalpur, Chattisgarh	2,000
Do.		do.	Duburi, Odisha[1]	3,000
Do.		Steel Authority of India Ltd. (Government, 100%)	Rourkela steel plant, Odisha[1]	1,800
Do.		Rashtriya Ispat Nigam Ltd.	Visakhapatnam steel plant, Andhra Pradesh	3,200
Do.		JSW Steel Co. Ltd.	Vijayanagar, Karnataka	7,800
Do.		Ministeel plants (privately owned)	180 plants located throughout India	4,700
Do.		Essar Steel Co. Ltd.	Hazira, Gujarat	3,000
Do.		Lloyds Steel Industries Ltd.	Wardha, Maharashtra	500
Do.		MSP Steel and Power Ltd.	Raipur, Chhattisgarh	750

See footnotes at end of table.

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TABLE 2—Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Iron ore	National Mineral Development Corp. Ltd. (NMDC) (Government, 100%)	Bailadila, Chhattisgarh	9,000
Do.	Steel Authority of India Ltd. (Government, 100%)	Bastar and Durg District, Chhattisgarh	7,000
Do.	Kudremukh Iron Ore Co. Ltd. (Government, 100%)	Kudremukh, Chikmagalur District, Karnataka	10,300
Do.	National Mineral Development Corp. Ltd. (NMDC) (Government, 100%)	Donimalai, Karnataka	9,000
Do.	Chowgule and Co. Ltd.	Goa	2,500
Do.	Dempo Mining Corp. Ltd.	do.	2,500
Do.	V.M. Salgaocar & Bros. Pvt. Ltd.	do.	2,500
Do.	Sesa Goa Ltd. (Vedanta Resources plc, 51%)	Codli and Sonshi, Goa	NA
Do.	Steel Authority of India Ltd. (Government, 100%)	Kendujhar District, Odisha[1]	3,000
Do.	Tata Steel	do.	2,000
Do.	Indian Iron and Steel Co. Ltd. (a wholly owned subsidiary of Government-owned Steel Authority of India Ltd.), 100%	Singhbhum District, Bihar	2,500
Do.	Steel Authority of India Ltd. (Government, 100%)	do.	3,500
Do.	Tata Steel	do.	3,500
Kyanite	Associated Mining Co.	Bhandara District, Maharashtra	10
Do.	Maharashtra Mineral Corp. Ltd.	do.	10
Do.	Bihar State Mineral Development Corp. Ltd. (Bihar State government, 100%)	Singhbhum District, Bihar	10
Do.	Hindustan Copper Ltd. (HCL) (Government, 100%)	do.	22
Lead:			
Primary	Hindustan Zinc Ltd. (Sterlite Opportunities and Ventures Ltd., 64.9%, and Government, 29.5%)	Chanderiya smelters, Rajasthan	85
Do.	do.	Tundoo smelter, Bihar	8
Secondary	Indian Lead Co.	Thane refinery, Mumbai, Maharashtra	25
Do.	do.	Wada, Mumbai, Maharashtra	40
Lead ore	Hindustan Zinc Ltd. (Sterlite Opportunities and Ventures Ltd., 64.9%, and Government, 29.5%)	Agnigundala Mine, Andhra Pradesh	72
Do.	do.	Sargipalli Mine, Odisha[1]	150
Lead-zinc ore	do.	Rampura-Agucha Mine, Rajasthan	1,300
Do.	do.	Zawar Mine group, Rajasthan	1,200
Magnesite	Burn Standard Co. Ltd. (Government, 100%)	Salem, Tamil Nadu	150
Do.	Dalmia Magnesite Corp.	do.	72
Do.	Tamil Nadu Magnesite Ltd. (Tamil Nadu State government, 100%)	do.	150
Manganese ore[3]	Manganese Ore India Ltd. (Government, 100%)	Adilabad, Andhra Pradesh	NA
Do.	Falechand Marsingdas	Andhra Pradesh	NA
Do.	Manganese Ore India Ltd. (Government, 100%)	Balaghat, Madhya Pradesh	NA
Do.	J.A. Trivedi Bros.	do.	NA
Do.	Sandur Manganese and Iron Ores Ltd.	Bellary, Karnataka	NA
Do.	Manganese Ore India Ltd. (Government, 100%)	Bhandara, Maharashtra	NA
Do.	Eastern Mining Co.	North Kanara, Karnataka	NA
Do.	Mysore Minerals Ltd.	do.	NA
Do.	Manganese Ore India Ltd. (Government, 100%)	Keonjhar, Odisha[1]	NA
Do.	Mangilah, Rungta (Pvt.) Ltd.	do.	NA
Do.	Orissa Mining Corp. Ltd.	do.	NA
Do.	Rungta Mines (Pvt.) Ltd.	do.	NA
Do.	Serajuddin & Co.	do.	NA
Do.	S. Lall & Co.	do.	NA

See footnotes at end of table.

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TABLE 2—Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Manganese ore[3]—Continued		Tata Steel	Keonjhar, Odisha[1]	NA
Do.		Orissa Mineral Development Co. Ltd.	Koraput, Odisha[1]	NA
Do.		Orissa Mining Corp. Ltd.	do.	NA
Do.		Mysore Minerals Ltd.	Shimoga, Karnataka	NA
Do.		Aryan Mining & Trading Corp.	Sundargarh, Odisha[1]	NA
Do.		Orissa Manganese & Minerals (Pvt.) Ltd.	do.	NA
Do.		Tata Steel	do.	NA
Do.		R.B.S. Shreeram Durga Prasad and Falechand Marsingdas	Vizianagaram, Andhra Pradesh	NA
Mica	metric tons	Micafab India Pvt. Ltd.	Sydapuram Mandal, Andhra Pradesh	4,500
Do.	do.	Premier Mica Co.	Rjupalem, Andhra Pradesh	200
Petroleum, refined products	thousand 42-gallon barrels per day	Cochin Refineries Ltd. (Oil and Natural Gas Corp., 55%, and private interests, 45%)	Ambalamugal refinery, Kerala	93
Do.	do.	Indian Oil Corp. (Oil and Natural Gas Corp., 91%, and private interests, 9%)	Barauni refinery, Bihar	66
Do.	do.	Bongaigaon Refinery and Petrochemicals Ltd. (a subsidiary of Government-owned Oil and Natural Gas Corp.), 100%	Bongaigaon refinery, Assam	27
Do.	do.	Indian Oil Corp. (Oil and Natural Gas Corp., 91%, and private interests, 9%)	Digboi refinery, Assam	12
Do.	do.	do.	Guwahati refinery, Assam	20
Do.	do.	do.	Haldia refinery, West Bengal	61
Do.	do.	Reliance Industries Ltd.	Jamnagar refinery, Gujarat	540
Do.	do.	do.	Koyali refinery, Gujarat	185
Do.	do.	Madras Refineries Ltd. (Oil and Natural Gas Corp., 52%, and private interests, 48%)	Madras refinery, Tamil Nadu	131
Do.	do.	Bharat Petroleum Corp. Ltd. (Oil and Natural Gas Corp., 67%, and private interests, 33%)	Mahul refinery, Mumbai, Maharashtra	135
Do.	do.	Hindustan Petroleum Corp. Ltd. (Oil and Natural Gas Corp., 51%, and private interests, 49%)	do.	110
Do.	do.	Essar Oil Ltd.	Vadinar refinery, Gujarat	300
Do.	do.	do.	Visakhapatnam refinery, Andhra Pradesh	90
Do.	do.	Indian Oil Corp. (Oil and Natural Gas Corp., 91%, and private interests, 9%)	Mathura refinery, Uttar Pradesh	156
Do.	do.	do.	Panipat refinery, Haryana	240
Phosphate rock[4]		Rajasthan State Mineral Development Corp. Ltd. (Rajasthan State government, 100%)	Badgaon, Dakankotra, Kanpur, Kharbaria-ka-Guda, and Sallopat Mines, Rajasthan	NA
Do.		Pyrites Phosphates and Chemicals Ltd.	Durmala and Maldeota underground mines, Uttar Pradesh	NA
Do.		Madhya Pradesh State Mining Corp. Ltd. (Madhya Pradesh State government, 100%)	Hirapur and Khatamba Mines, Jharkhand	NA
Do.		Rajasthan State Mines and Minerals Ltd. (Rajasthan State government, 100%)	Jhamarkotra Mine, Rajasthan	NA
Do.		Hindustan Zinc Ltd. (HZL) (Sterlite Opportunities and Ventures Ltd., 64.9%, and Government, 29.5%)	Maton Mine, Rajasthan	NA
Titanium, ilmenite-rutile ore		Kerala Minerals and Metals Ltd. (Kerala State government, 100%)	Chavara, Kerala	100
Do.		Indian Rare Earths Ltd. (IREL) (Government, 100%)	do.	250
Do.		do.	Ganjam, Odisha[1]	220
Do.		do.	Manavalakurichi, Tamil Nadu	65
Do.		Trimex Group	Chennai, Andhra Pradesh	200
Do.		VV Mineral Ltd.	Kanyakumari, Tamil Nadu	450

See footnotes at end of table.

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TABLE 2—Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Zinc	Binani Zinc Ltd.	Binanipuram smelter, Kerala	38
Do.	Hindustan Zinc Ltd. (HZL) (Sterlite Opportunities and Ventures Ltd., 64.9%, and Government, 29.5%)	Chanderiya smelter, Rajasthan	340
Do.	do.	Debari smelter, Rajasthan	78
Do.	do.	Visakhapatnam (Vizag) smelter, Andhra Pradesh	54

[e]Estimated. Do., do. Ditto. NA Not available.
[1]Formerly Orissa.
[2]Scheduled startup is delayed to 2012.
[3]Capacity of clusters of surface mines varies extremely, depending on demand. Estimated total capacity is 3.0 million metric tons per year (Mt/yr).
[4]Estimated total phosphate rock capacity is 1.5 Mt/yr.

TABLE 3
INDIA: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Barite	34,000
Bauxite	539,000
Chromite ore	54,000
Coal:	
Bituminous	106,000,000
Lignite	39,000,000
Copper ore	394,000
Gold, in metal kilograms	67,000
Graphite	11,000
Ilmenite and rutile	193,000
Iron ore	8,120,000
Kyanite and sillimanite	1,380
Lead and zinc ore	63,000
Limestone	7,500,000
Magnesite	70,000
Manganese ore	49,000
Phosphate rock	34,800
Talc and pyrophyllite	74,600
Zircon	1,350

Source: Indian Minerals Yearbook 2010, Indian Bureau of Mines.

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The Mineral Industry of Indonesia

By Chin S. Kuo

Indonesia has abundant mineral resources, which include coal, copper, gold, natural gas, nickel, and tin. The country also has less significant resources of bauxite, petroleum, and silver. The development and exploitation of minerals and oil and gas continued to play an important role in the country's economic growth. Indonesia was among the five leading producers of copper and nickel in the world, and its tin output was ranked second after China. It was also ranked among the world's top 10 countries in the production of gold and natural gas. Indonesia was the world's second ranked exporter of liquefied natural gas (LNG) after Qatar but was a net importer of oil.

Minerals in the National Economy

Indonesia's real gross domestic product (GDP) growth was 6.5% in 2011. The country's industrial output accounted for 24.3% of its total GDP based on purchasing power parity. The industrial sector grew by 6.2% in 2011. The country's mineral industry—primarily the cement, metal mining, and oil and gas industries—contributed modestly to its industrial production. The value of mineral commodity production accounted for 12.2% of the GDP. The fertilizer industry and the mining and quarrying industries grew by 4.0% and 1.4%, respectively, during the year. The cement and iron and steel industries increased by 7.2% and 13.1%, respectively, whereas the oil and gas industry registered negative growth of 0.9%. The Government encouraged investment in new oil and gas exploration to stem the decline in production (Ministry of Industry, 2012, p. 9, 54–55).

Government Policies and Programs

A central database of mining rights in the country had been developed by the Directorate General of Minerals and Coal of the Ministry of Energy and Mineral Resources. The aims were to ensure coordination, verification, and synchronization of mining business permits (Ijin Usaha Pertambanga, or IUPs) issued by the Government, local governments, and regencies so that mining investment could be stimulated and state revenues increased. The initiative was the result of the 2009 mining law regarding minerals and coal. As of May 21, 2011, the reconciled data consisted of IUPs issued prior to May 1, 2010, that were categorized as "clear and clean" (3,971), indicating that their areas were not subject to overlaps, and "non clear and clean" (4,504), indicating that additional data collection was needed. A "clear and clean" IUP is considered to be validly issued, whereas a "non clear and clean" IUP is considered to have missing information and consequently does not meet the Government's requirements (Mondaq.com, 2011).

Production

In 2011, production of primary aluminum decreased by 3.6% after a decline of 1.7% in 2010. Production of mined copper decreased by 38% owing to the lower grade of the ore mined at Grasberg. The output of smelted copper, however, remained at about the same level as in 2010. The output of gold decreased by 9.6% whereas that of silver increased by 14%. The output of mined nickel decreased by 7.5% whereas that of nickel in ferronickel increased by 5.4%. Because of the Government's continued crackdown on illegal tin mining, small tin smelters received less tin ore. As a result, production of mined tin and tin metal was estimated to have decreased slightly. The large changes in the production of ilmenite (decreased by 70%) and zircon (increased by 160%) were possibly owing to the fluctuations of the country's export quotas (table 1).

Structure of the Mineral Industry

State-owned PT Antam Tbk (Antam) produced bauxite, gold, nickel, and silver. PT Krakatau Steel, PT Pertamina, PT Tambang Batubara Bukit Asam, and PT Tambang Timah Tbk were engaged in the production of steel, oil, coal, and tin, respectively. Private-sector PT Indocement Tunggal Prakarsa Tbk was the leading cement producer in the country. International companies were active in Indonesia's metals mining and processing industries. Partially foreign-owned PT Freeport Indonesia Co. and PT Newmont Nusa Tenggara were engaged in the mining of copper and gold. PT International Nickel Indonesia Tbk produced nickel ore and matte, and PT Koba Tin produced tin ore and tin metal (table 2).

Mineral Trade

In 2011, Indonesia's total exports were valued at $203.5 billion, and the export items included metals (bauxite, copper, nickel, and tin) and mineral fuels (coal, LNG, natural gas, and petroleum). The major export markets were, in descending order of the export value, China, Japan, the United States, India, Singapore, Malaysia, and the Republic of Korea. Total imports were valued at $177.4 billion, and the import items included crude petroleum, iron and steel, and petroleum products. The major import partners were, in descending order of the value of the imports received, China, Japan, the United States, Singapore, Thailand, the Republic of Korea, and Malaysia (Ministry of Industry, 2012, p. 58–60).

Commodity Review

Metals

Bauxite and Alumina.—Construction of a $450 million 300,000-metric-ton-per-year (t/yr) chemical-grade alumina plant (which will eventually be expanded to 500,000 t/yr) at Tayan in West Kalimantan Province by PT Indonesia Chemical Alumina (ICA) began in April 2011. Commercial production of the plant was expected to begin in March 2014. ICA's parent company, Antam, secured $292.5 million of financing from Japanese banks for the project, in addition to Government funding.

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Bauxite feedstock for the plant would come from Antam's operations at Kijang on Bintan Island. ICA was 80% owned by Antam and 20% owned by Showa Denko of Japan. From the initial output, Showa would be allocated 200,000 t/yr and Antam would sell 100,000 t/yr to the Indonesian market. About 10% to 20% of Showa's share would be exported to China and the Republic of Korea and the rest would be sold to the Japanese market (Roberts and O'Driscoll, 2011).

Copper.—Finders Resources Ltd. of Australia was granted key mineral production permits for the development of the Wetar copper project. The permits were valid for 20 years. The mining permit was awarded to PT Batutua Kharisma Permai, and the processing and refining permit was awarded to PT Batutua Tembaga Raya. Finders Resources was the operator and held a 95% interest in the project. The project comprised two high-grade deposits that were suitable for open pit mining—the Kali Kuning and the Lerokis deposits. The project was expected to produce value-added copper cathode. Brownfield production capacity expansion of the existing demonstration plant to 7,000 t/yr to include the addition of solvent extraction-electrowinning processing technology would be followed by the construction of a second processing plant to increase the production capacity to 25,000 t/yr (Finders Resources Ltd., 2011).

The Government instituted a new requirement that, as of 2014, all minerals have to be processed in the country before being exported. To meet this requirement, Indonesia would need a new copper smelter. In 2011, Norilsk Nickel of Russia signed a memorandum of understanding with Indonesia's Nusantara Smelting Corp. to build a 400,000-t/yr copper smelter in Indonesia. The Ministry of Energy and Mineral Resources approved the plans in principle. PT Smelting Co.'s 270,000-t/yr-capacity copper smelter at Gresik in East Java Province was the only copper smelter in Indonesia. PT Smelting Co. was 60.5% owned by Mitsubishi Materials Corp. of Japan (Ana Rebelo, Chief Statistician, International Copper Study Group, written commun., May 13, 2011).

Gold and Silver.—In April, Archipelago Resources plc of the United Kingdom poured first gold at its 95%-owned Toka Tindung gold project in North Sulawesi Province. Dore ingots containing approximately 70% gold and 30% silver were shipped to the Logam Mulia refinery in Jakarta. In the ore processing plant, the oversized crusher and mills were acquired from the El Tambo gold mine in Chile. The company had 85,000 metric tons of run-of-mine ore stockpiled on the pad near the main pit. The project had a resource of 52,900 kilograms (kg) of gold equivalent, of which 34,200 kg would be minable by open pit. An average production of 4,980 kilograms per year (kg/yr) of gold equivalent was planned for the next 6 years after initial production of 3,420 kg in 2011. Mining began at Pajajaran, which was the second open pit to be developed at the Toka Tindung project. Exploration drilling remained focused on the extension of the ore body around the planned open pits and in the Batupangah area. Archipelago Resources had acquired a 10% interest in the project from PT Austindo Nusantara Jaya to increase its total ownership to 95% from 85% (London Stock Exchange plc, 2011).

Gold production of G-Resources Group Ltd. of Hong Kong's $576 million Martabe gold-silver project in North Sumatra Province would be delayed until April 2012. The project was estimated to contain 209,000 kg of gold and 2,120,000 kg of silver and was designed to produce 7,780 kg/yr of gold and 71,500 kg/yr of silver. The estimated capital was $576 million for the project. The project's equity funding yielded $213 million, and together with other funds, gave a total of $315 million, which was sufficient to fund the completion of the project (Mining Journal, 2011c).

Paniai Gold Ltd. of Australia agreed to sell its interest in the Derewo River (colluvial/elluvial) gold project in Papua Province to West Wits Mining Ltd. of Australia and became West Wits' largest shareholder, with a 28% stake. ECR Minerals plc of the United Kingdom held a 16% interest in Paniai. The Derewo River project consisted of a 40-hectare (ha) mining license, an application for a 491-ha mining license, and exploration license applications covering 129,000 ha. An environmental impact statement was submitted to Provincial authorities. Certain major capital items were purchased and transported to the project area by Paniai. The company also signed an indigenous landowners' agreement with Papua's Wolami people (ECR Minerals plc, 2011).

Iron Ore and Iron and Steel.—A feasibility study indicated that the development of Indo Mines Ltd.'s 70%-owned Jogjakarta iron sands project on Java Island would be viable. A reserve of 163.5 million metric tons (Mt) at an average grade of 13.7% iron was estimated. The project area extended 22 kilometers (km) along the coast and 1.8 km inland. The $158.3 million treatment plant would use simple magnetic separation to generate 2 million metric tons per year (Mt/yr) of concentrate (55% iron) for the production of direct-reduced iron. Concentrate would also be exported through the Port of Glagah (Mining Journal, 2011b).

Steel Authority of India and the Government signed a memorandum of understanding to build a 3-Mt/yr steel plant in Central Kalimantan Province. The plant would have an initial capacity of 3 Mt/yr and would be increased to 7 Mt/yr later. Three major iron and steel projects on Kalimantan Island that were in the planning stage included PT Mandan Steel's 1-Mt/yr billet plant, PT Meratus Jaya Iron Steel's 315,000-t/yr direct-reduced iron plant, and PT Semeru Surya Steel's 300,000-t/yr billet plant. PT Mandan Steel's plant was scheduled to begin construction in 2012; no dates for the start of construction for the other two projects had been set (Metal Bulletin, 2011).

Nickel.—China Nickel Resources Holdings Co. Ltd. intended to buy an 80% interest in PT Yiwan Mining for $266 million. Yiwan Mining's nickel-iron mine at Mekarsari had an estimated resource of 177 Mt and covered an area of 4,000 ha. China Nickel Resources expected to secure a supply of 3 Mt/yr of nickel-iron ore from the mine (Mining Journal, 2011a).

Titanium.—Trimex Group of India planned to invest more than $800 million during 10 years on a titanium project, which would include an ilmenite mine and separation plant and titanium dioxide and titanium metal plants. Construction of a $150 million pigment plant began in September 2011, and startup of the plant was expected in December 2013. The

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company planned to invest $350 million in expanding the plant's capacity to produce titanium slag in the second phase of the project, and $300 million to increase the production capacity for titanium metal and pigment in the third phase. Indonesia had large ilmenite resources of about 40 Mt (Watts and Feytis, 2011).

Industrial Minerals

Cement.—Indonesia's cement production capacity was projected to have increased by 4% in 2011 as many cement producers undertook major expansion plans. PT Semen Gresik, which was one of Indonesia's leading cement producers, planned to increase cement production to 26.5 Mt/yr in 2012 and to 30 Mt/yr by 2015. Plans were to build two cement plants costing $250 million each on the Islands of Java and Sumatra. PT Indocement also planned to increase cement output by 20% with the completion of a 1.5-Mt/yr cement plant at Cirebon in 2012. A new cement plant with a capacity of 2 Mt/yr at Citeureup was expected to be operational in 2013. Construction of PT Holcim Indonesia Tbk's new 1.7-Mt/yr cement plant at Tuban, East Java Province, was expected to be completed in 2013 (World Cement, 2011).

PT Semen Andalas, which was 99% owned by Lafarge S.A. of France, started operating its new $300 million 1.6-Mt/yr cement plant at Lhok Nga in Aceh Province in March 2011. The plant was a replacement for the one destroyed by the 2004 tsunami, and construction of the plant began in 2007. The company planned to build another $406 million 1.6-Mt/yr cement plant in Langkat Regency in North Sumatra Province, and that plant was expected to be completed in 2015 (International Cement Review, 2011b).

Conch Cement of China planned to construct four cement plants in Indonesia with a total investment of $2.35 billion. They were the $600 million Tanah Crogot plant in East Kalimantan Province, which would have the capacity to produce 10,000 metric tons per day of clinker; the $400 million Tanjung plant in South Kalimantan Province; the $600 million Pontianak plant in West Kalimantan Province; and a $750 million cement plant (location unknown) in West Papua Province. The capacities of the latter three plants had not been determined. China Triumph International Engineering Co. Ltd. was interested in building a $350 million 2.5-Mt/yr cement plant at Grobogan in Central Java Province (International Cement Review, 2011a).

Local Bosowa Corp. planned to spend $120 million to expand its cement production and distribution capacity in South Sulawesi Province. The combined output of its two cement units, Semen Bosowa Maros and Semen Bosowa Batam, was expected to reach 3.5 Mt/yr in 2011. The company also planned to spend $75 million to build another cement plant at Maros. After completion of the plant in 2012, the company's cement production capacity would increase to 4.5 Mt/yr (Global Cement Weekly, 2011a).

Lafarge planned to build a new cement plant on a 300-ha site in the Langkat district in North Sumatra Province. The $406 million 1.5-Mt/yr plant was expected to be onstream by 2015. The region was rich in limestone deposits (Global Cement Weekly, 2011b).

Mineral Fuels

Coal.—PT Adaro Energy Tbk's wholly owned subsidiary PT Alam Tri Abadi acquired a 75% stake in PT Mustika Indah Permai (MIP) from Elite Rich Investment Ltd. of the British Virgin Islands for $222.5 million in August 2011. MIP developed a greenfield coal project in South Sumatra Province and held a 2,000-ha mining permit that would be valid for 20 years. The structure, thickness, and quality of the coal seams were considered well defined by the density of the due diligence drill holes. The geologic information that was available indicated an open cut coal mining potential (PT Adaro Energy Tbk, 2011).

Local Ephindo Energy Pvt. Ltd. became Indonesia's first commercial coalbed methane (CBM) producer in 2011. The company (24%) and its partner Dart Energy Ltd. of Australia (24%) managed the production-sharing contract (PSC) in the Sangatta-1 Block in East Kalimantan Province. Pertamina held a 52% interest. The 22.6-Mt/yr facility was not fully utilized. The ultimate goal was to deliver the methane gas to the Bontang LNG plant between 2013 and 2014. Indonesia had the fifth-ranked potential CBM resource in the world at 12.8 trillion cubic meters, located mainly in the Provinces of East Kalimantan and South Sumatra. The Government had awarded seven new CBM licenses and eight more were up for bidding. The Government had set a goal for the country to produce 14.2 million cubic meters per day by 2015 (Evans, 2011).

Natural Gas.—Mitsubishi Corp. of Japan acquired all the shares of Tomori E&P Ltd., which owned a 20% interest in the Senoro-Toili natural gas field in Central Sulawesi Province, from PT Medco Energi Internasional Tbk for $260 million. Medco Energi still had a 30% stake in the Senoro-Toili natural gasfield, and Pertamina owned the remaining 50%. Development work on the field would begin with the aim of producing gas in 2014. Approximately 7.1 million cubic meters per day of gas from the field would be supplied to PT Donggi-Senoro LNG to produce LNG, which would be exported to Japan and the Republic of Korea. Donggi-Senoro LNG had a production capacity of 2 Mt/yr. Mitsubishi was involved in the development of the Kangean oil and gas field and operation of the Tangguh LNG project (Rigzone.com, 2011c).

Premier Oil plc of the United Kingdom planned to bring its Gajah Baru natural gas field in Block A in the West Natuna Sea onstream in October 2011. Gas from the West Natuna had been sold to Singapore under a 27-year sales contract, and Block A's share would be 3.4 million cubic meters per day. The company exported gas through a 3.2-km 40-centimeter pipeline to the onshore Semgas facility in Singapore and also delivered gas to domestic buyers. Premier Oil operated the field and held a 28.67% interest; the other owners were Kufpec of Kuwait (33.33%), Amerada Hess of the United States (23%), and Petroliam Nasional Berhad of Malaysia (15%) (Rigzone.com, 2011b).

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Energy World Corp. of Australia planned to build a 3-Mt/yr LNG import terminal in East Java Province. During the second phase of development, the capacity of the terminal would be expanded and a gas-fired powerplant would be built. Construction of the second-phase project would take 18 to 24 months. The company operated the Sengkang LNG project and owned the 195-megawatt Sengkang gas-fired powerplant in South Sulawesi Province (Petroleum Economist, 2011b).

Petroleum.—The Government awarded two oil and gas PSCs to BP p.l.c.—the offshore West Aru I and West Aru II in the Arafura Sea in Maluku Province. The contract areas are located 500 km southwest of the BP-operated North Arafura PSC and covered 8,100 square kilometers (km^2) and 8,300 km^2, respectively. In addition, BP gained access to the Kalimantan CBM block (Rigzone.com, 2011a).

Niko Resources of Canada (operator, 57.5%) and Amerada Hess (42.5%) jointly developed the offshore Kofiau PSC under the terms of a farmout agreement. Niko Resource had acquired 2,266 km^2 of three-dimensional seismic data and 1,050 km of two-dimensional seismic data at Kofiau. The companies planned to drill a number of wells in the contract area in 2012 (Petroleum Economist, 2011a).

Outlook

Indonesia's economic growth is expected to increase to 6.7% in 2012, according to the Asian Development Bank. In addition to the Grasberg Mine, the Wetar copper project is expected to increase the country's copper output in the near future, and a new copper smelter would add 400,000 t/yr of capacity to the current 270,000 t/yr produced at Gresik. Gold production is expected to increase with the operations of the Toka Tindung and the Martabe projects in 2012. The steel industry is expected to be diversified into production of direct-reduced iron and steel products. The cement industry is likely to be a key beneficiary of the Government's infrastructure and property development projects. Cement demand is expected to increase by 4% to 5% to 49 Mt, and total cement production is expected to reach 64 Mt in 2013. Production of CBM is expected to increase owing to increasing capacity utilization and the granting of more operating licenses. The output of LNG is also expected to increase with production from the Donggi-Senoro and the Sengkang projects.

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TABLE 1
INDONESIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010[e]	2011[e]
METALS						
Aluminum:						
Bauxite, wet basis, gross weight[e]	thousand metric tons	12,000 [r]	17,000 [r]	15,000 [r]	27,000 [r]	40,000
Metal, primary		242,100	242,500	257,600 [r]	253,300 [r,2]	244,100 [2]
Chromite sand, dry basis[e]		1,000	1,000	1,000	1,000	1,000
Cobalt, metal[e]		1,600	1,300	1,200	1,600	1,600
Copper:						
Mine, Cu content		796,900	632,600	998,530	878,376 [2]	542,700 [2]
Metal:						
Smelter, primary		277,100	253,300	295,900 [r]	276,800 [r,2]	276,200 [2]
Refinery, primary		277,000	254,000	289,200	278,200 [r,2]	257,000 [2]
Gold, mine output, Au content[3]	kilograms	117,851	64,390	140,488	106,316 [2]	96,100 [2]
Iron and steel:						
Iron sand, dry basis		61,077	65,000 [e]	44,552	45,610 [2]	46,000
Metal:						
Ferroalloys:						
Ferronickel		92,500	87,800	62,700 [r]	93,300 [r,2]	94,000
Ferromanganese[e]		12,000	12,000	12,000	12,000	12,000
Silicomanganese[e]		6,000	7,000	7,000	8,000	8,000
Pig iron, direct-reduced iron	thousand metric tons	1,420	1,290	1,230	1,360 [2]	1,400
Steel, crude	do.	4,160	3,915	3,500 [e]	3,700	3,800
Steel, semimanufactured[e]	do.	5,400	5,200	5,000	4,900	5,100
Manganese:						
Ore and concentrate, gross weight[2]		132,000	183,000	253,600	207,400	119,100
Mn content		46,200	64,100	88,800	72,600	41,700
Nickel:						
Mine output, Ni content[4]		229,200	219,300 [r]	202,800	235,800 [r,2]	218,200 [2]
Matte, Ni content		77,928	73,356	68,228	77,186 [2]	75,000
Ferronickel, Ni content		18,532	17,566	12,550	18,688 [r,2]	19,700 [2]
Silver, mine output, Ag content	kilograms	268,967	226,051	359,451	271,534 [2]	310,400 [2]
Tin:						
Mine output, Sn content		66,137	53,228	46,078	43,258 [2]	42,000
Metal[5]		64,127	53,471	51,418	43,832 [2]	43,000
Titanium mineral concentrates, ilmenite, gross weight		14,000	9,000	9,000	60,000	18,000
Zirconium concentrates, gross weight[e]		111,000 [2]	65,000	63,000	50,000 [r]	130,000
INDUSTRIAL MINERALS						
Cement, hydraulic[e]	thousand metric tons	36,000	36,000	22,195 [2]	28,000	29,000
Clays:[e]						
Bentonite		5,500	6,000	6,000	6,500	6,500
Fire clay	thousand metric tons	2,100	2,100	2,200	2,200	2,300
Kaolin powder		150,000	150,000	186,010 [2]	170,000	175,000
Diamond:[e]						
Industrial	thousand carats	23	28	28	30	30
Gem	do.	7	7	7	7	7
Total	do.	30	35	35	37	37
Feldspar[e]		25,000	26,000	10,730 [2]	20,000	18,000
Gypsum[e]		6,000	6,000	8,133 [2]	7,000	7,500
Iodine[e]		75	75	75	75	75
Nitrogen, N content of ammonia[e]	thousand metric tons	4,400	4,500	4,600	4,800	5,000
Phosphate rock[e]		600	600	600	600	600
Salt, all types[e]	thousand metric tons	700	700	585 [2]	600	650
Stone:[e]						
Dolomite		3,200	3,300	1,885 [2]	2,500	2,400
Granite	thousand metric tons	4,300	4,400	4,500	4,600	4,700
Limestone	do.	1,700	1,800	1,912 [2]	1,900	2,000
Marble	do.	6,500	7,000	7,489 [2]	8,000	7,800
Quartz sand and silica stone		35,000	38,000	32,105 [2]	36,000	37,000

See footnotes at end of table.

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TABLE 1—Continued
INDONESIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010[e]	2011[e]
INDUSTRIAL MINERALS—Continued						
Sulfur, elemental[e]		500	500	473 [2]	500	520
Zeolites[e]		1,400	1,400	1,530 [2]	1,400	1,500
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite[e]	thousand metric tons	53,000	54,000	34,348 [2]	118,988 [2]	110,000
Bituminous	do.	178,791	188,717	196,209	137,801 [2]	150,000
Gas, natural:						
Gross	million cubic meters	79,410	81,842	73,587	77,741 [2]	80,000
Marketed[e]	do.	76,664 [2]	78,985 [2]	70,000	75,000	76,000
Petroleum, crude including condensate	thousand 42-gallon barrels	305,000	311,000	346,000	341,000 [2]	340,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto.
[1]Table includes data available through September 13, 2012.
[2]Reported figure.
[3]Includes Au content of copper ore and output by Government-controlled foreign contractor operations. Gold output by operators of so-called people's mines and illegal small-scale mines is not available but may be as much as 20 metric tons per year (t/yr).
[4]Includes a small amount of cobalt that was not recovered separately.
[5]Output by Central Government-controlled foreign contractor operations. Tin output from small tin smelters is not available but may be as much as 40,000 t/yr.

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TABLE 2
INDONESIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Locations of main facilities	Annual capacity[e]
Aluminum:				
Bauxite		PT Antam Tbk (Government, 65%)	Kijang, Bintan Island, Riau	1,300
Metal		PT Indonesia Asahan Aluminum (Nippon Asahan Aluminum Co. Ltd., 59%, and Government, 41%)	Kual Tanjun, North Sumatra	250
Cement		PT Indocement Tunggal Prakarsa Tbk	Cirebon and Citeureup, West Java; Tarjun, South Kalimantan	18,600
Do.		PT Semen Andalas Indonesia (Lafarge S.A., 99%)	Besar, Aceh	1,400
Do.		do.	Lhok, Aceh	1,600
Do.		PT Semen Baturaja	Baturaja-Ogan Komering Ulu, South Sumatra	1,250
Do.		PT Semen Bosowa Maros	Kabupaten Maros, Sulawesi Selatan	1,800
Do.		PT Holcim Tbk	Narogong, East Java	9,700
Do.		PT Semen Gresik Tbk	Gresik and Tuban, East Java	8,200
Do.		PT Semen Padang	West Sumatra	5,440
Do.		PT Semen Tonasa	Pangkep, Sulawesi Selatan	3,480
Coal		PT Adaro Indonesia (New Hope Corp., 50%; PT Asminco Bara Utama, 40%; Mission Energy, 10%)	Paringin and Tutupan, South Kalimantan	35,000
Do.		PT Arutmin Indonesia (PT Bumi Resources Tbk, 80%, and Bakrie Group, 20%)	Mulia, Senakin, and Satui, South Kalimantan, and Asam-Asam, East Kalimantan	20,000
Do.		PT Berau Coal (PT United Tractor, 60%; PT Armadian, 30%; Nissho Iwai, 10%)	Berau, East Kalimantan	13,000
Do.		PT Kaltim Prima Coal Co. (PT Bumi Resources Tbk, 100%)	East Kutai Regency, East Kalimantan	36,000
Do.		PT Kideco Jaya Agung (Samtan Co. Ltd., 100%)	Pasir, East Kalimantan	12,000
Do.		PT Tambang Batubara Bukit Asam (state-owned)	Tanjung Enim and Ombilin, South Sumatra	19,000
Copper:				
Concentrate		PT Freeport Indonesia Co. (Freeport-McMoRan Copper & Gold Inc., 81.28%; Government, 9.36%; others, 9.36%)	Ertsberg and Grasberg, Papua	800
Do.		PT Newmont Nusa Tenggara (Newmont Mining Corp., 45%; Sumitomo Corp., 35%; PT Pukuafu Indah, 20%)	Sumbawa Island, West Nusa Tenggara	300
Metal		PT Smelting Co. (Mitsubishi Materials Corp., 60.5%; PT Freeport Indonesia Co., 25%; others, 14.5%)	Gresik, East Java	270
Gas:				
Natural	millon cubic meters per day	ExxonMobil Oil Indonesia	Arun and Aceh, North Sumatra	48
Do.	do.	Roy M. Huffington (subsidiary of HUFFCO Group)	Badak, East Kalimantan	28
Do.	do.	Total Indonesie	Offshore East Kalimantan	59
Liquefied		PT Arun LNG Co. Ltd. (Government, 55%; Mobil Oil Co., 30%; Japan Indonesia LNG Co., 15%)	Balang Lancang amd Aceh, North Sumatra	12,500
Do.		PT Badak LNG Co. Ltd. (Government, 55%; HUFFCO Group, 30%; Japan Indonesia LNG Co., 15%)	Bontang, East Kalimantan	22,500
Coalbed methane		Ephindo Energy Pvt. Ltd. (PT Pertamina, 52%; Dart Energy Ltd., 24%)	Sangatta, East Kalimantan	22,600
Gold	metric tons	Aurora Gold Ltd. (100%)	Balikpapan, Central Kalimantan	60
Do.	do.	Archipelago Resources plc (95%)	Tok Tindung, North Sulawesi	5
Do.	do.	PT Antam Tbk (Government, 65%)	Bogor, West Java	3
Do.	do.	PT Freeport Indonesia Co. (Freeport-McMoRan Copper & Gold Inc., 81.28%; Government, 9.36%; others, 9.36%)	Ertsberg and Grasberg, Papua	110
Do.	do.	PT Newmont Nusa Tenggara (Newmont Mining Corp., 45%; Sumitomo Corp., 35%; PT Pukuafu Indah, 20%)	Sumbawa Island, West Nusa Tenggara	16
Do.	do.	PT Nusa Halmahera (PT Aneka Tambang Tbk, 17.5%, and PT Newcrest Mining Ltd., 82.5%)	Halmahera Island, Maluku	24
Do.	do.	PT Prima Lirang Mining (Billiton BV, 90%, and PT Prima Maluku Indah, 10%)	Lerokis, Wetar Island	3
Nickel:				
In ore		PT Antam Tbk (Government, 65%)	Pomalaa, South Sulawesi, and on Gebe Island	80
Do.		PT International Nickel Indonesia Tbk (Inco Ltd., 59%; Sumitomo Metal Mining Co. Ltd., 20%; others, 21%)	Soroako, South Sulawesi	70
In matte		PT Antam Tbk (Government, 65%)	Pomalaa, South Sulawesi	24
Do.		PT International Nickel Indonesia (Inco Ltd., 59%; Sumitomo Metal Mining Co. Ltd., 20%; others, 21%)	Soroako, South Sulawesi	68

See footnotes at end of table.

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TABLE 2—Continued
INDONESIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Locations of main facilities	Annual capacity[e]
Nickel-iron, ore	PT Yiwan Mining (China Nickel Resources Holdings Co. Ltd., 80%)	Mekarsari, West Java	3,000
Nitrogen	PT Aseah-Aech Fertilizer (Government, 60%, and other members of the Association of Southeast Asian Nations, 40%)	Lhokseumawe, North Sumatra	506
Do.	PT Pupuk Iskandar Muda (Government, 100%)	do.	506
Do.	PT Pupuk Kalimantan Timur (Government, 100%)	Bontang, East Kalimantan	1,010
Do.	PT Pupuk Kujang	Cikampek, West Java	330
Do.	PT Pupuk Sriwijawa (Government, 100%)	Palembang, South Sumatra	1,440
Petroleum:			
Crude thousand barrels per day	Atlantic Richfield Indonesia, Inc. (subsidiary of Arco Co.)	Arjuna and Arimbi, offshore West Java	170
Do. do.	China National Offshore Oil Co.	Offshore southeastern Sumatra	100
Do. do.	Maxus Southeast Asia Ltd. (subsidiary of Maxus Energy)	Cinta and Rama, offshore southeast Sumatra	95
Do. do.	PT Pertamina (Government, 100%)	Jatibarang, West Java, and Bunyu, offshore East Kalimantan	80
Do. do.	PT Caltex Pacific Indonesia (Texaco Inc., 50%, and Chevron Corp., 50%)	Minas, Duri, and Bangko, central Sumatra	700
Do do.	Total Indonesie (subsidiary of Total S.A.)	Handi and Bakapai onshore and offshore East Kalimantan	180
Refined do.	PT Pertamina (Government, 100%)	6 locations	1,047
Silver	PT Antam Tbk (Government, 65%)	Bogor, West Java	25
Do.	PT Freeport Indonesia Co. (Freeport-McMoRan Copper & Gold Inc., 81.28%; Government, 9.36%; others, 9.36%)	Ertsberg and Grasberg, Papua	220
Do.	PT Kelian Equatorial Mining (Rio Tinto Group, 90%, and PT Harita Jaya Raya, 10%)	180 kilometers west of Samarinda	10
Steel, crude	PT Ispat Indo	Sidoarjo, Surabaya	700
Do.	PT Krakatau Steel (Government, 100%)	Cilegon, West Java	2,400
Do.	PT Komatsu Indonesia Tbk	Jakarta	8
Do.	PT Wahana Garuda Lestari	Pulogadung, Jakarta	410
Tin:			
In ore	PT Koba Tin (Malaysia Smelting Corp., 75%, and PT Tambang Timah Tbk, 25%)	Koba, Bangka Island	25
Do.	PT Tambang Timah Tbk (Government, 65%)	Onshore and offshore islands of Bangka, Belitung, and Singkep	60
Metal	Mentok Tin Smelter (PT Tambang Timah Tbk)	Mentok, Bangka Island, South Sumatra	68
Do.	Koba Tin Smelter (PT Koba Tin)	Koba, Bangka Island, South Sumatra	25

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.

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THE MINERAL INDUSTRY OF JAPAN

By Chin S. Kuo

A great earthquake and tsunami struck eastern Japan on March 11. The hardest hit areas were the Prefectures of Fukushima, Iwate, and Miyagi. The disaster caused 15,848 known fatalities and 6,011 injuries and left 3,305 people missing. It also completely destroyed 128,582 houses and partially destroyed 243,914 houses. The Government estimated the cost of the losses, including disaster relief and reconstruction, to be up to $309 billion. In the nonferrous metals industry, operations were temporarily shut down owing to power failure, gas and water cutoffs, and damage to plants and equipment. Operations at the copper, lead, and zinc refineries were halted but were restarted between April and July. Operations at major production centers for electronic materials and rare metals were either restored to full operation or partly restarted by the end of August. The steel industry and a leading refractory producer were also affected. The shutdown of several calcium carbonate plants and the operations of quartz plants affected the country's paper and glass industries. An oil refinery in Chiba Prefecture and another in Sendai were set ablaze by the quake, and the liquefied natural gas (LNG) import terminal in Sendai also was damaged. As a result of the disaster, the Government closed 17 nuclear powerplants that had a combined capacity of 9,700 megawatts (MW) and paid the powerplant operators for the shutdowns under the Act on Compensation for Nuclear Damages (Y. Kita, Director, Rare Metals Stockpile, Japan Oil, Gas and Metals National Corp., written commun., February 29, 2012).

Japan was a producer and consumer of nonferrous metals. The country imported ores and concentrates to produce copper, lead, nickel, and zinc. It also imported intermediate products and refined them into other metals, such as molybdenum, tin, and tungsten. Copper concentrate, iron ore, and rare-earth elements (REE) were the most valuable mineral commodity imports for Japan. The country remained the world's second ranked producer of steel after China.

Minerals in the National Economy

Japan was the world's third ranked economy after the United States and China. In 2011, Japan's gross domestic product based on purchasing power parity was $4.497 trillion, which was a decrease of 0.7% from that of 2010 owing to the effects of the earthquake and tsunami. The mineral industry played an important role in supplying industrial raw materials from domestic sources and imports to Japan's manufacturing and construction industries. The mineral processing industry in particular was large and included the processing of chemicals, fabricated metal products, industrial mineral products, iron and steel, nonferrous metals, and petroleum products (U.S. Central Intelligence Agency, 2012).

Government Policies and Programs

To compete with China, the Government was looking to invest billions of dollars in projects in South Africa in the areas of strategic minerals, rare earths, and infrastructure and to buy stakes in these projects either through Japan Oil, Gas, and Metals National Corp. (JOGMEC) directly or through Japanese mining and trading companies to which JOGMEC provided loans. Japan was participating in manganese and platinum projects in South Africa and a uranium project in Namibia. China had already spent billions of dollars on projects in Africa trying to secure the mineral resources it needed (Mineweb.com, 2011a).

Production

Japan's output of nonferrous metals, such as high-purity aluminum, cadmium, total smelted copper, total refined copper, and nickel in ferronickel, decreased by more than 10% owing to the effects of the March 2011 earthquake and tsunami. Production of total lead and total zinc also decreased by 7% and 5.2%, respectively. Output of silver and gold decreased by 7.4% and 2.9%, respectively, but production of platinum and palladium increased by 32.6% and 23.4%, respectively. In the iron and steel sector, Japan's production of ferroalloys, crude steel, and pig iron decreased slightly by 6.6%, 1.8%, and 1.5%, respectively, compared with the output in 2010. In the energy sector, production of carbon black, coke, crude petroleum, and natural gas also decreased slightly by 6.6%, 5.5%, 4.7%, and 2.9%, respectively; the decreases in output of the latter two were owing to depleted reserves. Output of some metals, such as secondary aluminum, antimony metal, cobalt, molybdenum, tin, and titanium dioxide, showed increases of various magnitudes. In the industrial minerals sector, production of sulfur from petroleum refining and quicklime decreased by 7.2% and 6.3%, respectively (table 1).

Structure of the Mineral Industry

Japan's mineral industry is characterized by small-scale, low-tonnage mining operations and high-value-added mineral and metal processing and manufacturing activities. Its mining industry is not significant to the economy, and the country consumes more minerals and metals from imports than it produces. In 2011, mining and quarrying of industrial minerals, including dolomite, iodine, limestone, pyrophyllite, silica sand, and silica stone, was still being done but at a lower level of production than in previous years. Operating mines and employment in the mining industry had been in decline because of depleted ore reserves, high mining costs, and the availability of cheaper imports. Japan had, however, a world-class metallurgical industry for nonferrous metals. Mining and mineral-processing businesses were owned and operated by private companies (table 2).

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Mineral Trade

Japan imported raw materials and energy for its industrial production and use. Imported mineral commodities were mostly bauxite, coke, copper concentrate, and iron ore, whereas imported energy included coal, LNG, and petroleum. In 2011, Japan imported about 1.15 million metric tons (Mt) of copper, 423,000 metric tons (t) of zinc, and 96,000 t of lead, all in concentrates. The country imported 127,000 t of refined copper and exported 437,000 t. Japan imported 78,000 t of refined zinc and 22,000 t of refined lead and exported 95,000 t and 33,000 t, respectively. The country also imported 1,929,000 kilograms (kg) of silver and exported 2,834,000 kg. Japan imported a total of 315,000 kg of cadmium metal mainly from China and the Republic of Korea and exported a total of 895,000 kg of cadmium metal to China (69%), India (20%), Belgium (9%), and Brazil (2%) (Japan Mining Industry Association, 2012, p. 5, 10, 11–13, 28).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—In 2011, Japan produced 142,000 t of secondary aluminum, which was an increase of 12.7% compared with that of 2010, and 47,000 t of primary aluminum. The country exported 290,000 t of rolled aluminum products and 13,500 t of unwrought aluminum and imported 2.69 Mt of unwrought aluminum, 60,500 t of aluminum waste and scrap, and 116,900 t of rolled aluminum products. Demand for aluminum decreased by 2.2% to 3.85 Mt, of which transportation accounted for 38%; building and construction, 14%; fabricated metal, 13%; food, 11%; and other uses, 11% (Japan Aluminum Association, 2012).

By building a new production line to meet increasing demand, Sumitomo Chemical Co. Ltd. planned to expand the production capacity of high-purity alumina at its Ehime plant to 3,200 metric tons per year (t/yr) from 2,000 t/yr in April 2012. High-purity alumina was used in fillers for magnetic media, in composite resins, and in ceramic parts and substrates in electronics and semiconductors. Demand for high-purity alumina was expected to increase, and the company was considering building another production line in 2013 (Hodge, 2011).

Cadmium.—At the beginning of 2011, Japan had stocks of 262 t of cadmium metal. With production of 1,755 t and imports of 315 t, the country's supplies increased to 2,332 t. With an apparent consumption of 1,155 t and exports of 895 t for a total demand of 2,050 t, Japan's stocks increased to 282 t at the end of 2011 (Japan Mining Industry Association, 2012, p. 29).

Copper.—The country produced about 1.17 Mt of anode and blister copper from primary sources and 270,000 t from scrap. It also produced about 1.33 Mt of refined copper primarily from imported ore (82%), scrap (8.7%), and other sources (8.9%). Consumption of refined copper was reported to be about 1.06 Mt. Refined copper was used in the manufacturing of wire (63%), brass (36%), and miscellaneous products (1%), such as copper alloy and copper alloy casting (table 3; Japan Mining Industry Association, 2012, p. 11).

The earthquake caused Pan Pacific Copper Co., Ltd. to halt operations at its Hitachi copper refinery, which had a capacity of 130,000 t/yr of copper. Mitsubishi Materials Corp. also halted production at its 300,000-t/yr Onahama copper smelter owing to power outages. The disruption caused by logistical and infrastructure damage was likely to take some time to fix. Sumitomo Metal Mining Co. Ltd. (SMM) did not have a copper smelter in the region hit by the earthquake and produced the planned 404,000 t of copper in 2011 (Reuters, 2011a).

Gold and Silver.—In 2011, Japan produced about 132,000 kg of gold from imported ore, other sources, scrap, and domestic ore, which accounted for 68%, 16%, 11%, and 4% of the source material, respectively. The country also produced about 1,724,000 kg of silver from imported ore, other sources, scrap, and domestic ore, which accounted for 59%, 23%, 17%, and 0.4% of the source material, respectively. Silver was used for miscellaneous applications (44%), in photographic materials (28%), in extension materials (11%), in point connectors (7%), as a nitrate for other uses (5%), and for silver solder (5%) (table 3; Japan Mining Industry Association, 2012, p. 10).

Iron and Steel.—After the massive earthquake and tsunami, JFE Steel Corp. halted production at its 10-million-metric-ton-per-year (Mt/yr) Higashi Nihon steel plant near Tokyo and two of its three minimills, one in Sendai in Miyagi Prefecture and the other at Kamisu in Ibaraki Prefecture, which had also been crippled. Nippon Steel Corp. suspended operations at two small steel plants—the Kamaishi plant in Iwate Prefecture for steel products and the Tokyo plant for seamless steel. The Kamaishi plant had the capacity to produce 60,000 metric tons per month (t/mo) of wire rods used in tires and bridges. Tokyo Iron and Steel Co. Ltd. halted operations at its Oyama plant in Tochigi Prefecture and Hachinohe plant in Aomori Prefecture. Both had produced high-strength steel bars. Sumitomo Metal Industries Ltd. (Sumitomo Metals) also suspended production at its 8.3-Mt/yr-capacity Kashima steel plant in Ibaraki Prefecture because the blast furnaces, converter, and hot-rolling equipment had been damaged. The Kashima plant produced about one-half of Sumitomo Metals' crude steel output. Overall, a total of 15 to 18 Mt/yr of steel production capacity was affected to some extent. Owing to global overcapacity of steel, the reduction in output in Japan had limited effect on the world steel prices. Japan was the world's second ranked steel producer after China (Mineweb.com, 2011b).

Nippon Steel and Sumitomo Metals settled on a merger ratio as the two prepared to combine their operations to create the world's second ranked steelmaker after ArcelorMittal of Luxembourg. The transaction would be worth about $22.45 billion. The new company would be called Nippon Steel & Sumitomo Metal Corp. and would have a production capacity of between 60 and 70 Mt/yr of crude steel. The planned merger was scheduled for October 2012. The merger would give the company a foothold in the pipe sector in addition to the high-end flat-steel sector (Mineweb.com, 2011c).

To improve operational efficiency, JFE Steel planned to integrate its group of companies Daiwa Steel Corp., JFE Bars & Shapes Corp., Tohoku Steel Corp., and Toyohira Steel Corp. in April 2012. The four steelmakers had a combined capacity of 3.8 Mt/yr of crude steel and operated electric arc furnaces (EAFs)

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to produce construction-grade steel. Tohoku Steel's Sendai plant stopped production after the earthquake and was not to be restarted. JFE Bars & Shapes restarted its Sendai operation to produce specialty steel in August (Reuters, 2011b).

Shinkansai Steel Co. Ltd. decided to close one of the two rolling mills at its Hoshida plant in Osaka to cut fixed costs and increase operational efficiency. The company produced 13,000 t/mo of round rebars and flats. The closure accounted for 30% of the company's production capacity (Yieh Corp., 2011a).

In October, Nippon Steel and Kobe Steel Co. Ltd. launched the operation of a new plant under the joint-venture company Nittetsu Shinko Metal Refining Co. Ltd. to recycle steel mill dust to produce direct-reduced iron. The new plant was intended to alleviate the price volatility of iron-making materials (Yieh Corp., 2011b).

Chuo Denki Kogyo Co. Ltd., which was a major ferroalloy producer in Japan, restarted one of its EAFs at Kashima in Ibaraki Prefecture and expected to restart its other EAF in late March for the production of ferromanganese or silicomanganese, depending on the supply of raw materials. The company produced high-carbon ferromanganese, which is added to steel to give it strength and toughness (Metal Bulletin, 2011).

Lead.—Japan produced a total of 248,600 t of lead in 2011. Of this amount, 215,000 t was refined lead made from 100,000 t of primary ore (which included imported ore and domestic ore) and 115,000 t of scrap and material from other sources. The remaining 33,600 t was remelted lead. Consumption of refined lead was reported to be 190,000 t. Refined lead was used in batteries (92%), other miscellaneous applications (3%), chemicals (2%), and solder (1%) (table 3; Japan Mining Industry Association, 2012, p. 12, 14).

Nickel.—Japan produced 41,290 t of refined nickel and 113,210 t of nickel in ferronickel and nickel oxide for a total of 154,500 t of nickel. The country also produced 2,383 t of nickel chemicals. At the end of 2011, stocks of refined nickel, which totaled 2,927 t, and those of ferronickel, which totaled 4.004 t, remained with the producers (Japan Mining Industry Association, 2012, p. 4, 7).

Pacific Metals Co. restarted operations of its 44,000-t/yr Hachinohe nickel plant in June after the plant was submerged by the tsunami in March. The company was partially owned by Nippon Steel and Sumikin Stainless Steel Corp. These two companies' stainless steel production was partly shifted to the Hikari plant in western Japan because of damage to their Kashima plant (Reuters, 2011c).

Titanium.—Sakai Chemical Industry Co. Ltd.'s Onahama titanium dioxide plant (the Yumoto works and the Otsurugi works) in Fukushima Prefecture was damaged by the earthquake. Before the earthquake, the company had produced a total of 39,300 t/yr of titanium dioxide from the two works. The company also operated a 30,000-t/yr titanium sulfate plant on the west coast of Honshu Island (TZ Minerals International Pty. Ltd., 2011).

Toho Titanium Co. Ltd. planned to expand the capacity to produce titanium sponge at its Wakamatsu plant to 15,600 t/yr from 12,000 t/yr to meet the growing demand. Construction would start in February and was expected to be completed in April 2012. The company's other titanium sponge plant at Chigasaki had a production capacity of 13,200 t/yr (Toho Titanium Co. Ltd., 2011).

Zinc.—The country produced a total of about 578,800 t of zinc. Of this amount, 544,700 t was refined zinc made from 444,400 t of primarily imported ore (81%) and 100,200 t of other sources (18%) and scrap (0.3%). The remaining 34,200 t was remelted zinc. Consumption of refined zinc was reported to be 350,000 t. Refined zinc was used mainly in galvanized sheet (49%), other types of galvanized products (15%), brass (15%), die-casting alloy (7%), chemicals (9%), and miscellaneous uses (4%) (table 3; Japan Mining Industry Association, 2012, p. 13, 16).

Mitsui Mining and Smelting Co. Ltd. planned to increase zinc production at two plants in western Japan after operations at its Hachinohe zinc smelter were halted owing to the earthquake. Toho Zinc Co. Ltd. halted operations at its 110,000-t/yr Annaka zinc smelter and its Onahama plant, which was used to process zinc for smelting. The Annaka plant operated at 30% capacity when the Onahama plant opened in June (Reuters, 2011d).

Industrial Minerals

Cement.—Japan's cement production capacity amounted to 61.5 Mt/yr from 18 producers operating 21 integrated cement plants. Taiheiyo Cement Corp. was the leading producer with a capacity of 28.8 Mt/yr, followed by Sumitomo Osaka Cement Co. Ltd., Mitsubishi Materials, and Ube Industries Ltd. The earthquake affected cement plants with a combined capacity of 7 Mt/yr in the disaster-struck region. Plant closures reduced the listed capacity by 5 Mt/yr. Severe damage was reported at Hachinohe Cement Co., Ltd.'s plant in Hachinohe, Aomori Prefecture; Hitachi Cement Co. Ltd.'s plant in Hitachi, Ibaraki Prefecture; Taiheiyo Cement's plant in Ofunato, Iwate Prefecture; and Mitsubishi Materials' plant in Higashiyama, Iwate Prefecture. Reconstruction demand for cement was estimated to be 10 Mt during 5 years (Kerton, 2011).

In June, Sumitomo Osaka Cement restarted operation of its cement plant at Sano in Tochigi Prefecture, which had been suspended because radioactive cesium was found in sewage sludge used to make the cement. Radioactive cesium had been released from the crippled Fukushima Daiichi nuclear powerplant, and the company decided not to use sludge from sewage treatment plants in Fukushima Prefecture (Nikkei.com, 2011).

Sumitomo Osaka Cement also planned to restructure its production and distribution operations. One (having a capacity of 400,000 t/yr) of the two kiln lines at the Sano plant would be shut down. The reduced output at Sano would allow the company to increase the utilization rates at two other cement plants: one in Kochi Prefecture and the other in Hyogo Prefecture. As a result, the company's overall utilization rate was expected to be more than 90% of its total capacity of 9 Mt/yr (International Cement Research, 2011).

Graphite.—Showa Denko planned to increase the production capacity of 'structure-controlled micro graphite' anode material used in lithium-ion batteries to 1,000 metric tons per day (t/d) at its plant in Omachi, Nagano Prefecture, by the middle of 2012. Also by then, the company would add a new production line to double its capacity of anode and cathode additive 'vapor-grown

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carbon fiber' to 200 t/d at its Kawasaki plant in Kanagawa Prefecture. The expansions were owing to growing demand for lithium-ion batteries by the automotive industry and for storage batteries in household applications (Watts, 2011c).

Iodine.—Japan had 5 Mt of iodine reserves, which were extracted from brines of the Minami Kanto natural gas field in Chiba Prefecture. Major producers in the iodine industry included Godo Shigen Sangyo Co. and ISE Chemicals Corp. Japan was the world's second ranked producer after Chile, and its total estimated production capacity was 10,700 t/yr. Operations were disrupted for at least 3 months after the earthquake (Watts, 2011a).

Limestone.—Fimatec Ltd.'s 60,000-t/yr calcium carbonate plant at Soma in Fukushima Prefecture was flooded by the tsunami. Its joint-venture 96,000-t/yr plant with Nippon Paper at Ishinomaki in Miyagi Prefecture was closed. Imerys SA of France's 60,000-t/yr plant also at Ishinomaki was damaged. The paper industry used ground and precipitated calcium carbonate as fillers and coatings to improve the qualities of paper (Industrial Minerals, 2011).

Lithium.—Mitsubishi was looking to develop a lithium project in Chile. Currently (2011), the company bought lithium from Sociedad Quimica y Minera of Chile, which extracted lithium solutions from the Salar de Atacama in Chile. Mitsubishi intended to manufacture 20,000 units of electric vehicles in 2011, and the lithium-ion battery packs would require 299 t of lithium carbonate equivalent. The company also signed an offtake agreement with Lithium Americas of Canada, which was building a 40,000-t/yr lithium carbonate production facility in the Salar de Cauchari in Argentina in 2012 (Elliott and Watts, 2011).

Rare Earths.—Japan was the world's leading importer of rare earths and was actively seeking supply sources other than China. Japanese traders Toyota Tsusho and Sojitz and Lavreco of Vietnam planned to develop the Dong Pao rare-earths project in Lai Chau Province, Vietnam, and to start producing 3,000 t/yr of rare-earth oxide (REO) by 2013. Production was expected to increase to 6,000 t/yr of REO later in the project. Toyota Tsusho and magnet group Shin-Etsu were building a rare earths processing plant in the State of Orissa in India in a joint venture with Indian Rare Earths Ltd. The plant was expected to produce 3,000 to 4,000 t/yr of REO in 2013. Sojitz and Lyons Corp. of Australia had reached a deal for the latter's processing plant in Malaysia to supply 8,500 t/yr of REO to Japan during a 10-year period (Watts and others, 2011).

Molycorp Inc. (30%) of the United States formed a joint-venture company with Daido Steel Co. Ltd. (35.5%) and Mitsubishi Corp. (34.5%) to build a 500-t/yr rare-earth (neodymium-iron-boron) sintered magnets plant at Nakatsugawa in Gifu Prefecture by January 2013. The joint venture was formed to make use of Molycorp's raw materials from its Mountain Pass Mine in California, Daido Steel's magnet technologies, and Mitsubishi's marketing and sales networks (Watts, 2011b).

Mineral Fuels

Natural Gas.—Owing to the shutdown of most of its nuclear powerplants following the earthquake and tsunami, Japan was required to import 3 to 5 more LNG cargoes (64,000 t each) per month to make up for the power-generation loss. There were no reports of LNG terminals being damaged, except for Cosmo Oil's terminal at the Port of Chiba. The closest terminal to the earthquake's epicenter was Shin-Minato, which had a small capacity of 800,000 t/yr. Utilization of gas-fired power-generating capacity increased where there had been no damage to regasification terminals or gas-fired powerplants. Imports of LNG were expected to increase in the long term in Japan. Coal-generated power also might temporarily substitute for nuclear power. Nuclear power had accounted for 30% of Japan's electricity needs before the earthquake (Petroleum Economist, 2011).

Petroleum.—Six Japanese oil refineries halted operations after the earthquake, suspending a combined refining capacity of 1.4 million barrels per day. JX Nippon Oil and Energy Corp. shut down its 145,000-barrel-per-day (bbl/d) Sendai refinery and its 252,200-bbl/d Kashima refinery, and Cosmo Oil shut down its 220,000-bbl/d Chiba refinery. The shutdown of refineries was expected to tighten the supply of petroleum products in Asia as the region's refineries entered the spring maintenance programs. The spread of products by the cracking process started to show an apparent shift. The increase in demand for low-sulfur fuel oil for power generation was expected owing to the closure of the nuclear powerplants. Some refineries planned to increase their refining capacity to make up for the loss—the Nansei Sekiyu Nishihara refinery, by 11,000 bbl/d; the Okayama and Oita refineries, by 30,000 bbl/d each; and the Mizushima refinery, by 19,800 bbl/d. Imports of low-sulfur crudes was another option. Replacing the lost nuclear power-generating capacity would require the equivalent of 204,000 bbl/d of oil (Oil & Gas Journal, 2011).

Reserves and Resources

Japan has large reserves of industrial minerals, including dolomite, iodine, limestone, pyrophyllite, silica sand, and silica stones. Limestone is the most abundant indigenous mineral resource. The country's reserves of nonferrous metals, such as lead, silver, and zinc, are small, with the exception of gold; gold deposits had been found and were being mined on a small scale in Kagoshima Prefecture on Kyushu Island. The country's coal reserves were reaching depletion. Japan's reserves of gas and oil are negligible (table 4).

Outlook

The effect of the 2011 earthquake and tsunami on the mineral industry is expected to be short lived. Production capacity of steel in the country may be affected for 1 to 2 years; however, owing to the global overcapacity of steel, the reduction in output in Japan could stabilize the world steel prices. The reconstruction of earthquake-devastated areas is expected to increase the demand for building steel in the near term and will result in decreased steel exports. Although there appears to be spare production capacity in the cement industry, getting it back into operation and resuming the normal flows of raw materials and cement delivery will not be easy during the Government's reconstruction period. Imports of cement to supplement the

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production shortage may be an option. Japan is expected to diversify its supply sources of rare earths from such countries as Australia, India, the United States, and Vietnam. In the energy sector, consumption of coal, LNG, and various types of oil may increase as backup powerplants that burn fossil fuels will try to compensate for the loss of some nuclear power capacity. Imports of LNG are expected to increase in the long term in Japan.

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TABLE 1

JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011
METALS						
Aluminum:						
Alumina[e]	thousand metric tons	300	320	310	300	280
Aluminum hydroxide[e]	do.	700	700	710	700	690
Metal:						
Primary:						
Regular grades	do.	6	7	6 [e]	5 [e]	4 [e]
High-purity	do.	51	52	33	49	43
Secondary[2]	do.	153	149	111	126	142
Antimony:						
Oxide		7,939	6,954	4,884	6,846	7,000 [e]
Metal		270	325	239	304	435
Arsenic, trioxide[e]		40	40	40	40	40
Bismuth		408	480	423	454	460 [e]
Cadmium, refined		1,939	2,126	1,824	2,053 [r]	1,755
Chromium, metal[e]		500	600	650	700	800
Cobalt, metal		1,084	1,071	1,332	1,935	2,007
Copper, metal:						
Blister and anode:						
Primary		1,367,310	1,366,310	1,297,943	1,382,655	1,168,284
Secondary		245,208	259,060	243,859	260,245	269,748
Total		1,612,518	1,625,370	1,541,802	1,642,900	1,438,032
Refined:						
Primary		1,369,814	1,328,157	1,238,012	1,333,787	1,094,360
Secondary		207,004	211,681	201,831	214,901	233,238
Total		1,576,818	1,539,838	1,439,843	1,548,688	1,327,598
Gallium, metal:[e]						
Primary		8	7	7	6	6
Secondary		90	85	80	78	75
Germanium:[e]						
Oxide		50	50	50	50	50
Metal, polycrystal	kilograms	1,700	1,720	1,730	1,750	1,760
Gold:						
Mine output, Au content	do.	8,869	6,868	7,708	8,544	8,691
Metal:						
Primary	do.	117,529	81,399	89,281	98,398	95,549
Secondary[3]	do.	38,331	43,433	43,979	37,413	36,288
Total	do.	155,860	124,832	133,260	135,811	131,837
Indium, metal[e]	do.	60,000	65,000	67,000	69,000	70,000
Iron and steel, metal:						
Pig iron	thousand metric tons	86,771	86,171	66,943	82,283	81,028
Electric-furnace ferroalloys:						
Ferrochrome		12,016	13,888	7,698	16,208	17,217
Ferromanganese		420,151	431,181	361,375	453,265	456,798
Ferronickel		351,503	301,361	284,884	348,420	279,944
Silicomanganese		52,901	58,884	49,205	49,865	49,798
Ferromolybdenum		4,573	4,554	3,598	4,615	5,167
Ferrovanadium		3,205	3,477	2,560	4,190	3,980
Unspecified		13,982	14,478	12,957	16,374	20,913
Total		858,331	827,823	722,277	892,937	833,817
Steel, crude	thousand metric tons	120,203	118,739	87,534	109,599	107,601
Semimanufactures, hot-rolled:[e]						
Ordinary steels	do.	86,704 [4]	84,000	68,000	67,000	65,000
Special steels	do.	21,498 [4]	21,000	16,000	15,000	15,000

See footnotes at end of table.

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TABLE 1—Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011
METALS—Continued						
Lead, metal, refined:						
Primary		104,527	107,005	96,794	101,610	100,078
Secondary, including remelted		171,795	172,454	150,871	165,613	148,524
Total		276,322	279,459	247,665	267,223	248,602
Magnesium, metal, secondary[e]		12,000	13,000	13,000	14,000	14,000
Manganese, oxide[e]		45,000	45,000	44,000	43,000	43,000
Molybdenum, metal		1,172	1,217	695	1,154	1,234
Nickel metal:						
Refined		30,402	34,861	29,351	40,228	41,290
Ni content of nickel oxide sinter[e]		60,151 [4]	60,000	58,000	59,000	60,000
Ni content of ferronickel		68,346	59,259	54,491	64,349	53,210
Ni content of chemical		2,270	2,333	1,669	2,497	2,383
Total[e]		161,169 [4]	156,000	144,000	166,000	157,000
Platinum-group metals:						
Palladium, metal	kilograms	6,505	7,526	6,675	6,107	7,534
Platinum, metal	do.	1,000	1,442	1,417	1,331	1,765
Selenium, metal		806	754	709	754	750 [e]
Silicon, multicrystalline		7,364	7,471	8,633	8,700 [e]	12,133
Silver:						
Mine output, Ag content	kilograms	5,300	2,043	1,500 [e]	1,200 [e]	4,486
Metal:						
Primary	do.	2,263,009	2,042,604	1,865,936	1,898,208	1,724,218
Secondary[3]	do.	391,869	253,374	326,487	313,931	325,373
Total	do.	2,654,878	2,295,978	2,192,423	2,212,139	2,049,591
Tantalum, metal[e]		95	95	95	95	95
Tellurium, metal[e]		41 [4]	40	38	35	36
Tin, metal, smelter		879	956	757	841	947
Titanium:						
Dioxide		245,976	225,228	161,928	207,561	214,417
Metal[e]		42,000	45,000	35,000	38,000	40,000
Tungsten, metal		3,813	3,446	1,400	3,361	3,299
Vanadium, metal[e, 6]		560	560	560	560	560
Zinc:						
Oxide[e]		77,102 [4]	77,000	75,000	72,000	70,000
Metal:						
Primary		495,632	502,910	435,905	470,057	444,446
Secondary, including remelted		143,063	147,957	136,844	140,597	134,401
Total		638,695	650,867	572,749	610,654	578,847
Zirconium, oxide[e]		11,000	11,000	12,000	13,000	13,000
INDUSTRIAL MINERALS						
Bromine[e]		20,000	20,000	20,000	20,000	20,000
Cement, hydraulic	thousand metric tons	67,685	62,810	54,800	51,526	51,291
Clays:[e]						
Bentonite		430,000	435,000	432,000	430,000	425,000
Fire clay, crude		450,000	450,000	440,000	440,000	430,000
Kaolin		11,000	11,000	12,000	12,000	13,000
Diatomite[e]		120,000	115,000	110,000	110,000	100,000
Feldspar and related materials[e]		750,000	700,000	700,000	650,000	650,000
Gypsum[e]	thousand metric tons	5,850 [3]	5,800	5,750	5,700	5,600

See footnotes at end of table.

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TABLE 1—Continued

JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011
INDUSTRIAL MINERALS—Continued						
Iodine		9,282	9,500 e	8,232	9,216	9,277
Lime, quicklime	thousand metric tons	9,359	9,528	6,746	8,547	8,005
Nitrogen, N content of ammonia	do.	1,114	1,244	1,021	1,178	1,211
Perlite[e]		230,000	230,000	220,000	210,000	200,000
Rare-earth oxides[5]		8,561	8,435	5,121	10,699	10,700 e
Salt, all types[e]	thousand metric tons	1,190 [4]	1,200	1,200	1,122 r, 4	978 [4]
Silica:						
Sand	do.	4,314	3,664	2,856	3,078	3,003
Stone, quartzite	do.	12,258	10,682	9,189	9,159	9,543
Sodium compounds, n.e.s.:[e, 7]						
Soda ash		400,000	400,000	400,000	400,000	400,000
Sulfate, anhydrous		140,000	140,000	142,000	142,000	145,000
Stone, crushed:						
Dolomite	thousand metric tons	3,655	3,370	3,122	3,438	3,492
Limestone	do.	165,982	156,813	132,350	133,974	134,176
Sulfur:						
Byproduct of metallurgy[e]	do.	1,250 [4]	1,300	1,350	1,400	1,450
Byproduct of petroleum	do.	1,966	2,034	1,864	1,892	1,755
Talc and related materials:[e]						
Talc		26,000	26,000	25,000	24,000	24,000
Pyrophyllite		345,000	350,000	340,000	340,000	350,000
Vermiculite[e]		6,000	6,000	6,000	6,000	6,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black	thousand metric tons	835	821	575	729	681
Coal, bituminous[e, 8]	do.	1,340	1,300	1,100	1,000	900
Coke, including breeze, metallurgical	do.	38,707	38,568	32,587	37,447	35,379
Gas, natural:						
Gross[9]	million cubic meters	3,708	3,735	3,539	3,396	3,298
Marketed[e]	do.	3,900	3,900	3,700	3,600	3,500
Petroleum:						
Crude	thousand 42-gallon barrels	6,041	6,200	5,795	5,491	5,235
Refinery products:[e]						
Gasoline:						
Aviation	do.	50	50	50	50	50
Other	do.	365,000	360,000	362,000	360,000	355,000
Asphalt and bitumen	do.	33,000	33,000	32,000	31,000	30,000
Distillate fuel oil	do.	247,000	250,000	245,000	242,000	240,000
Jet fuel	do.	80,000	82,000	78,000	76,000	75,000
Kerosene	do.	175,000	170,000	165,000	166,000	165,000
Liquefied petroleum gas	do.	57,000	58,000	56,000	55,000	55,000
Lubricants	do.	16,500	17,000	16,000	14,000	15,000
Naphtha	do.	138,000	139,000	136,000	135,000	130,000
Paraffin, wax	do.	850	800	800	750	750
Petroleum coke	do.	4,600	4,500	4,400	4,300	4,200
Refinery fuel and losses[10]	do.	150,000	150,000	150,000	150,000	150,000
Residual fuel oil	do.	350,000	330,000	300,000	320,000	350,000
Unfinished oils	do.	50,000	50,000	50,000	50,000	50,000
Total	do.	1,670,000	1,640,000	1,600,000	1,600,000	1,620,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto.

[1]Table includes data available through November 7, 2012.

[2]Includes alloyed and unalloyed aluminum ingot.

[3]Includes gold metal recovered from scrap and waste.

[4]Reported figure.

[5]Includes oxide of cerium, europium, gadolinium, lanthanum, neodymium, praseodymium, samarium, terbium, and yttrium.

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TABLE 1—Continued

JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

[6]Represents metal content of vanadium pentoxide recovered from petroleum residues, ashes, and spent catalysts.

[7]Not elsewhere specified.

[8]All major coal mines had closed by January 2002, but eight smaller mines were still in operation in 2011.

[9]Includes output from gas wells and coal mines.

[10]May include some additional unfinished oils.

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TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Aso Cement Co., Ltd.	Tagawa and Kanda, Fukuoka Prefecture	2,400
Do.		Daiichi Cement Co., Ltd.	Kawasaki, Kanagawa Prefecture	1,169
Do.		Denki Kagaku K.K.	Omi, Niigata Prefecture	2,762
Do.		Hachinohe Cement Co., Ltd.	Hachinohe, Aomori Prefecture	1,533
Do.		Hitachi Cement Co., Ltd.	Hitachi, Ibaraki Prefecture	941
Do.		Mitsubishi Materials Corp.	Higashidori, Shimokita-gun, Apmori Prefecture; Higashiyama, Higashiiwai-gun, Iwate Prefecture; Yokoze, Saitama Prefecture; Kurosaki, Kyushu, and Higashitani, Fukuoka Prefecture	13,467
Do.		Mitsui Mining Co. Ltd.	Togawa, Fukuoka Prefecture	2,075
Do.		Myojo Cement Co., Ltd.	Itoigawa, Niigata Prefecture	2,482
Do.		Nippon Steel Chemical Co., Ltd.	Tobata, Kitakyushu, Fukuoka Prefecture	855
Do.		Nittetsu Cement Co., Ltd.	Muroran, Hokkaido Prefecture	1,589
Do.		Ryukyu Cement Co. Ltd.	Yabu, Nago, Okinawa Prefecture	722
Do.		Sumitomo Osaka Cement Co. Ltd.	Tamura, Fukushima Prefecture; Aso, Tochigi Prefecture; Motosu, Gifu Prefecture; Sakata, Shiga Prefecture; Ako, Hyogo Prefecture; and Susaki, Kochi Prefecture	14,402
Do.		Taiheiyo Cement Corp.	Ofunato, Iwate Prefecture; Kumagaya and Saitama, Saitama Prefecture; Fujiwara, Mie Prefecture; Tsukumi, Oita Prefecture; and Kamiiso, Hokkaido Prefecture	28,800
Do.		Tokuyama Cement Co. Ltd.	Nanyo, Yamaguchi Prefecture	5,936
Do.		Tosoh Corp.	Shin Nanyo, Yamaguchi Prefecture	2,869
Do.		Tsuruga Cement Co. Ltd.	Tsuruga, Fukui Prefecture	1,710
Do.		Ube Industries Ltd.	Ube and Isa, Yamaguchi Prefecture, and Kanda, Fukuoka Prefecture	10,736
Coal		Kushiro Coal Mine Co. Ltd.[1]	Kushiro, Hokkaido Prefecture	750
Cobalt, refined	metric tons	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	1,000
Copper, refined	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	225,600
Do.	do.	Onahama Smelting and Refining Co. Ltd. (Mitsubishi Materials Corp., 49.29%; Dowa Mining Co. Ltd., 31.15%; Furukawa Co. Ltd., 8.31%; Furukawa Electric Co. Ltd. and Mitsubishi Cable Industries Ltd., 4.17% each; others, 2.91%)	Onahama, Fukushima Prefecture	300,000
Do.	do.	Pan Pacific Copper Co., Ltd. (JX Nippon Mining & Metals Co., Ltd., 66%, and Mitsui Mining and Smelting Co., Ltd., 34%)	Saganoseki, Oita Prefecture; Hitachi, Ibaraki Prefecture; and Tamano, Okayama Prefecture[2]	710,000
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Besshi/Toyo (Saijyo), Ehime Prefecture	410,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	72,000
Gold:				
In concentrate	kilograms	Sumitomo Metal Mining Co. Ltd. (SMM)	Hishikari, Kagoshima Prefecture	9,000
Refined	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	24,000
Do.	do.	Mitsui Mining and Smelting Co., Ltd.	Takehara, Hiroshima Prefecture	22,000
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	60,000
Do.	do.	JX Nippon Mining & Metals Co., Ltd.	Hitachi, Ibaraki Prefecture	30,000
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	36,000

See footnotes at end of table.

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TABLE 2—Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iodine, crude	metric tons	Ise Chemical Industries Co. Ltd. (Asahi Glass Co. Ltd., 52.4%, and Mitsubishi Corp., 11.2%)	Oami-Shirasato, and Ichinomya, Chiba Prefecture; and Sadowara, Miyazaki Prefecture	3,600
Do.	do.	Godo Shigen Sangyo Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 11%, and Mitsui & Co. Ltd., 10%)	Chosei, Chiba Prefecture	2,400
Do.	do.	Kanto Natural Gas Development Co. Ltd. (Mitsui Chemicals, Inc., 21.9%, and Godo Shigen Sangyo Co. Ltd., 14.3%)	Mobara, Chiba Prefecture	1,200
Do.	do.	Nihon Tennen Gas Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 50%, and Tomen Corp., 41%)	Shirako and Yokoshiba, Chiba Prefecture	1,200
Do.	do.	Toho Earthtech, Inc. (Itochi Corp., 34.1%; Mitsubishi Gas Chemical Co. Ltd., 32.2%; Nippon Light Metal Co. Ltd., 31.1%)	Kurosaki, Niigata Prefecture	720
Do.	do.	Nippon Chemicals Co. Ltd. (Nippon Shokubai Co. Ltd., 17%; Takeda Chemical Industries Ltd., 16.4%; Chugai Boyeki Co. Ltd., 13.6%)	Isumi, Chiba Prefecture	720
Lead, refined	do.	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture[3]	33,600
Do.	do.	Mitsui Mining and Smelting Co., Ltd.	Takehara, Hiroshima Prefecture	43,800
Do.	do.	Toho Zinc Co. Ltd.	Chigirishima, Hiroshima Prefecture	120,000
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Harima, Hyogo Prefecture	30,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd.	Kosaka, Akita Prefecture	25,200
Do.	do.	Hosokura Smelting and Refining Mining Co. Ltd. (wholly owned subsidiary of Mitsubishi Materials Corp.)	Hosokura, Miyagi Prefecture[3]	22,200
Limestone		Mitsubishi Materials Corp.	Higashitani, Fukuoka Prefecture	10,000
Do.		Nittetsu Mining Co., Ltd.	Torigatayama, Kochi Prefecture; Oita, Oita Prefecture; and Shiriya, Aomori Prefecture	23,000
Do.		Sumikin Mining Co., Ltd.	Hachinohe Sekkai, Aomori Prefecture	5,500
Do.		Sumitomo-Osaka Cement Co. Ltd.	Ibuku, Shiga Prefecture, and Karazawa, Tochigi Prefecture	4,000
Do.		Shuho Mining Co., Ltd.	Sumitomo Cement Shuho, Yamaguchi Prefecture	8,200
Do.		Taiheiyo Cement Co. Ltd.	Ofunato, Iwate Prefecture; Ganji and Tsukumi, Oita Prefecture; Garo, Hokkaido Prefecture; Kawara, Fukuoka Prefecture, Tosayama, Kochi Prefecture; Taiheiyo Buko, Saitama Prefecture; and Shigeyasu, Yamaguchi Prefecture	46,000
Do.		Todaka Mining Co. Ltd.	Todaka-Tsukumi, Otia Prefecture	12,000
Do.		Ube Kosan Co. Ltd.	Ube Isa, Yamaguchi Prefecture	9,000
Manganese, electrolytic dioxide		Mitsui Mining and Smelting Co., Ltd.	Takehara, Hiroshima Prefecture	24
Do.		Tosoh Corp.	Hyuga, Miyazaki Prefecture	34
Nickel:				
In ferronickel	metric tons	Hyuga Smelting Co. Ltd. [wholly owned subsidiary of Sumitomo Metal Mining Co. Ltd. (SMM)]	do.	22,000
Do.	do.	Yakin Oheyama Co. Ltd.	Oheyama, Kyoto Prefecture	12,720
Do.	do.	Pacific Metals Co. Ltd.	Hachinohe, Aomori Prefecture	40,800
In oxide	do.	Tokyo Nickel Co. Ltd.	Matsuzaka, Mie Prefecture	60,000
Refined	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Niihama, Ehime Prefecture	36,000

See footnotes at end of table.

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TABLE 2—Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Pyrophyllite		Goto Kozan Co. Ltd.	Goto, Nagasaki Prefecture	204
Do.		Ohira Kozan Co. Ltd.	Ohira, Okayama Prefecture	132
Do.		Sankin Kogyo Co. Ltd.	Otsue, Hiroshima Prefecture	72
Do.		Shinagawa Shirenga Co. Ltd.	Mitsuishi, Okayama Prefecture	180
Do.		Shokozan Kogyosho Co. Ltd.	Yano-Shokozan, Hiroshima Prefecture	180
Do.		Showa Kogyo Co. Ltd.	Showa-Shokozan, Hiroshima Prefecture	60
Steel, crude		JFE Steel Corp. (wholly owned subsidiary of JFE Holdings Inc.)	Chiba, Chiba Prefecture; Kawasaki (Keihin), Kanagawa Prefecture; Nishinomiya, Hyogo Prefecture; Handa, Aichi Prefecture; Fukuyama, Hiroshima Prefecture; and Kurashiki, Okayama Prefecture	33,835
Do.		Kobe Steel Ltd.	Kakogawa and Kobe, Hyogo Prefecture	8,943
Do.		Nippon Steel Corp.	Oita, Oita Prefecture; Kawata, Fukuoka Prefecture; Kimitsu, Chiba Prefecture; and Nagoya, Aichi Prefecture	33,199
Do.		Sumitomo Metal Industries, Ltd.	Kashima, Ibaraki Prefecture; Kokura, Fukuoka Prefecture; and Wakayama, Wakayama Prefecture	12,820
Do.		Nisshin Steel Co. Ltd.	Kuri, Hiroshima Prefecture; Osaka City; Shunan, Yamaguchi Prefecture; and Toyo, Ehime Prefecture	4,000
Tantalum	metric tons	Japan New Metals Co. Ltd.	Akita, Akita Prefecture	95
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Miyama, Fukuoka Prefecture	NA
Titanium:				
In sponge metal		Sumitomo Titanium Corp. (Sumitomo Metal Industries, Ltd., 75.2%, and Kobe Steel Ltd., 24.8%)	Amagasaki, Hyogo Prefecture	24
Do.		Toho Titanium Co. Ltd. (JX Nippon Mining & Metals Co., Ltd., 47%; Mitsui & Co. Ltd., 20%; others, 33%)	Chigasaki, Kanagawa Prefecture	15
In dioxide	metric tons	Fuji Titanium Industry Co. Ltd. (Ishihara Sangyo Kaishia Ltd., 24.8%, and others, 75.2%)	Kobe, Hyogo Prefecture	17,400
Do.	do.	Ishihara Sangyo Kaisha Ltd.	Yokkaichi, Mie Prefecture	154,800
Do.	do.	Sakai Chemical Industries Co. Ltd.	Onahama, Fukushima Prefecture	60,000
Do.	do.	Tayca Corp.	Saidaiji, Okayama Prefecture	60,000
Do.	do.	Titan Kogyo Kabushiki Kaisha	Ube, Yamaguchi Prefecture	16,800
Zinc, refined	do.	Akita Smelting Co. Ltd. [Dowa Mining Co. Ltd., 57%; JX Nippon Mining & Metals Co., Ltd., 24%; Sumitomo Metal Mining Co. Ltd. (SMM), 14%; Mitsubushi Materials Corp., 5%]	Iijima, Akita Prefecture	200,400
Do.	do.	Hachinohe Smelting Co. Ltd. (Mitsui Mining and Smelting Co. Ltd., 57.7%; JX Nippon Mining & Metals Co., Ltd., 27.8%; Toho Zinc Co. Ltd. and Nisso Smelting Co. Ltd., 14.5%)	Hachinohe, Aomori Prefecture	117,600
Do.	do.	Hikoshima Smelting Co. Ltd.	Hikoshima, Yamaguchi Prefecture	84,000
Do.	do.	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	72,000
Do.	do.	Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	139,200
Do.	do.	Sumitomo Metal Mining Co. Ltd. (SMM)	Harima, Hyogo Prefecture	90,000

Do., do. Ditto. NA Not available.

[1]Coal mining operations continued, but output has been in decline.

[2]Saganoseki Smelter and Refinery and Hitachi Refinery (Nikko Smelting & Refining Co. Ltd.) [450,000 metric tons per year (t/yr)] and Tamano Smelter and Refinery (Hibi Kyoto Smelting Co. Ltd.) (260,000 t/yr).

[3]Secondary lead smelter and refinery.

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TABLE 3
JAPAN: SUPPLY AND DEMAND FOR SELECTED NONFERROUS METALS

(Metric tons unless otherwise specified)

	Refined copper			Refined lead		
	2009	2010	2011	2009	2010	2011
Stocks at the beginning of the year	124,379	104,409	110,279	22,134	17,303	16,521
Production	1,439,843	1,548,688	1,327,598	192,196	215,828	215,050
Imports	42,256	45,912	126,569	9,144	11,126	22,049
Total supply	1,606,478	1,699,009	1,564,446	223,474	244,257	253,620
Exports	626,685	528,384	437,247	55,521	40,461	33,367
Reported consumption	907,929	1,104,614	1,056,792	159,093	192,685	190,058
Total demand	1,534,614	1,632,998	1,494,039	214,614	233,146	223,425
Stocks at the end	104,409	110,279	121,041	17,303	16,521	15,168
Apparent consumption	875,384	1,060,346	1,006,158	150,650	187,275	205,085
	Refined zinc			Silver (kilograms)		
	2009	2010	2011	2009	2010	2011
Stocks at the beginning of the year	94,521	73,600	65,555	959,905	872,325	1,062,722
Production	540,604	574,008	544,676	1,865,936	1,898,208	1,724,218
Remelting	NA	NA	NA	326,487	313,931	325,373
Imports	27,533	31,855	77,881	1,343,705	2,087,621	1,929,204
Total supply	662,658	679,463	688,112	4,496,033	5,172,085	5,041,517
Exports	155,985	97,745	95,278	1,696,462	2,733,284	2,833,596
Reported consumption	318,922	388,692	349,567	1,392,946	1,854,798	1,631,894
Total demand	474,907	486,437	444,845	3,089,408	4,588,082	4,465,490
Stocks at the end	73,600	65,555	91,658	872,325	1,062,722	998,062
Apparent consumption	433,073	516,163	501,176	1,927,246	1,376,079	1,209,859

NA Not applicable.

Source: Japan Mining Industry Association.

TABLE 4
JAPAN: RESERVES OF MAJOR MINERAL COMMODITIES IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Exploitable reserves
Coal[1]		773,000
Dolomite		913,000
Gold ore, Au content	kilograms	159,000
Iodine		5,000 e
Limestone		40,400,000
Pyrophyllite		59,700
Silica sand		73,600
Silica stone, white		462,000

eEstimated.

[1]Recoverable reserves, including brown coal.

Source: Natural Resources and Fuel Department, Agency of Natural Resource and Energy.

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The Mineral Industry of North Korea

By Lin Shi

In 2011, the economy of North Korea (the Democratic People's Republic of Korea) grew for the first time since 2008. According to the Bank of Korea, North Korea's real annual gross domestic product (GDP) increased by 0.8% in 2011 compared with that of the previous year. This growth was mainly contributed by the agriculture sector, which showed an increase of 5.3% because of favorable weather conditions, and by the Pyongyang modernization project, which boosted the construction sector's contribution to the GDP by 3.9% (Bank of Korea, 2012).

Minerals mined in North Korea in 2011 included coal, copper, gold, iron ore, limestone, magnesite, and zinc. Coal-fired powerplants were the country's main sources of commercial energy. Petroleum for domestic consumption came almost entirely from imports. The country exported minerals and metallurgical products and imported coking coal, machinery and mining equipment, and petroleum. The mined minerals and the mineral products were used primarily for domestic industrial and military purposes and also to earn foreign currency. North Korea exported copper, iron ore, magnesia, tungsten, and zinc (Yam, 2011; U.S. Central Intelligence Agency, 2012).

Government Policies and Programs

North Korea began to revise Government policies in 2009; revisions included initiating the modernization project for Pyongyang City in 2010 and amending laws to give the Rason economic zone some autonomy in 2011 (Associated Press, The, 2012).

Minerals in the National Economy

The North Korean Government controlled the Nation's economy, including its mining activity and financial market. The Government directed a large share of the GDP to the military sector, which affected the country's overall economic performance. Although the mineral industry's production capacity was limited by the county's restricted financial and technical resources, the mineral industry supported the country's military sector expenses as well as met the country's industrial requirements for raw materials.

Production

Mining output increased by 0.9% in 2011 compared with that of 2010, of which the output of nonmetallic minerals decreased by 1.7%, except that of coal, which increased by 2.0%. The output of the manufacturing sector decreased by 3.0% in 2011 compared with that of 2010, of which light industrial production decreased by 0.1% (mainly because of the decreases in the production of textiles and shoes), and chemical and heavy industrial production decreased by a combined 4.2% (mainly because of decreases in the production of chemicals, fabricated metal, and machinery). Electricity and gas production decreased by 4.7% compared with that of 2010, mainly because of a decrease in thermal power generation, whereas the country's production of hydroelectric power increased (Bank of Korea, 2012).

Structure of the Mineral Industry

In 2011, the Government attracted foreign investors to participate in selected projects and planned to continue its effort to consolidate the heavy industries and develop light industries. The infrastructure construction activities increased, especially those funded by China and Russia (Sloan, 2012).

North Korea's mineral industry included a coal mining sector, a ferrous and nonferrous metals mining and processing sector, and an industrial minerals mining and processing sector. Most of the large-scale mining and mineral processing enterprises in North Korea were owned and operated by the central Government. Provincial and local governments owned and operated various small- and medium-scale mining and mineral processing facilities. Companies from China, the Republic of Korea, and other countries participated in joint ventures with North Korea for the development and operation of cement, coal, copper, gold, graphite, iron ore, lead and zinc, magnesite, and molybdenum production facilities in North Korea.

Mineral Trade

The value of North Korean exports in 2011 increased to $27.9 million from $15.1 million in 2010, or by 84.8%. Of this amount, the export value of minerals increased by 138.1% compared with that of 2010. The value of the country's total imports increased to $35.3 million from $26.6 million in 2010, or by 32.7%. Of this amount, the import value of chemical products increased by 39.6% compared with that of 2010. Total North Korean exports to the Republic of Korea decreased in value by 12.5% from that of 2010, although the exports of electric and electronic goods increased significantly, by 34.6%. North Korean imports from the Republic of Korea decreased in value by 7.8% compared with that of 2010 and included a decrease in the import value of textiles, by 13.5%, and electronic goods, by 7.6% (Bank of Korea, 2012).

Commodity Review

Metals

Copper.—Wanxiang Resources Co. Ltd. of China held a 51% stake in the Hyesan copper mine and had invested $860 million in the mine (Yonhap News, 2012). Wanxiang and the Ministry of Mining Industries of North Korea set up the Hyesan-China Joint Venture Mineral Co. to operate the Hyesan copper mine, which is located in Yanggang Province near Changbai City in China's Jilin Province. The mine had a designed capacity of about 70,000 metric tons per year of copper concentrate, all of

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which would be exported to China (Yam, 2011; Xinhuanet.com, 2011).

Gold.—The Daebong Mine was one of North Korea's major gold mines; it is located on the border of Gapsan and Woonheung in Yanggang Province. The Daebong Mine produced more than 150 kilograms (kg) (4,800 troy ounces) of gold annually. North Korea's State Development Bank tried to bring Chinese investment to the Daebong Mine by offering mineral rights in exchange for capital investment in the mine (Lee, 2010).

Industrial Minerals

Rare Earths.—According to the Asia Times, a significant amount of high-grade rare-earth metal (REM) deposits were found in the eastern and western parts of North Korea, and the type of discovered REMs could be used in the production of liquid crystal display panels and optical lenses. An REM reprocessing plant was built in Hamhung in the 1990s and had not been able to operate fully. The Republic of Korea had expressed interest in working with North Korea to explore and mine the REM deposits and to use the REMs to manufacture industrial products (Asia Times Online, 2012).

Outlook

North Korea's relationship and economic cooperation with the Republic of Korea is expected to begin to recover very slowly in the near future. The increasing international demand for minerals, especially demand from China and Russia, is likely to stimulate increased production of North Korea's minerals, such as coal, iron ore, magnesite, molybdenum, nickel, sand, and zinc. Because of the mineral industry's significance to the country's economy, the Government is expected to continue to work to attract international investments in North Korea's mining sector. Mining and associated business systems, such as international banking, the Internet, cell phone coverage, and power supply, are likely to be constructed, improved, and regulated in the economic free zones and the border areas to improve communications and promote economic cooperation among China, North Korea, Russia, and even the countries of Western Europe.

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TABLE 1

NORTH KOREA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
METALS						
Cadmium metal, smelter		200	200	200	200	200
Copper:						
Mine output, Cu content		12,000	12,000	12,000	12,000	12,000
Metal, primary and secondary:						
Smelter		15,000	15,000	15,000	15,000	15,000
Refinery		15,000	15,000	15,000	15,000	15,000
Gold, mine output, Au content	kilograms	2,000	2,000	2,000	2,000	2,000
Iron and steel:						
Iron ore and concentrate, marketable:						
Gross weight	thousand metric tons	5,130	5,316 [4]	5,300	5,300	5,300
Fe content	do.	1,400	1,488 [4]	1,500	1,500	1,500
Metal:						
Pig iron	do.	900	900	900	900	900
Ferroalloys, unspecified	do.	10	10	10	10	10
Steel, crude	do.	1,230	1,279 [4]	1,300	1,300	1,300
Lead:						
Mine output, Pb content		13,000	13,000	13,000	13,000	13,000
Metal, primary and secondary:						
Smelter		13,000	13,000	13,000	13,000	13,000
Refinery		9,000	9,000	9,000	9,000	9,000
Silver, mine output, Ag content		20	20	20	20	20
Tungsten, mine output, W content		230	270	100	100	100
Zinc:						
Mine output, Zn content		70,000	70,000	70,000	70,000	70,000
Metal, primary and secondary		75,000	75,000	75,000	75,000	75,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	6,130	6,415 [4]	6,400	6,400	6,400
Fluorspar		12,500	12,500	12,500	12,500	12,500
Graphite		30,000	30,000	30,000	30,000	30,000
Magnesite, crude	thousand metric tons	55,000	150,000	150,000	150,000	150,000
Nitrogen, N content of ammonia	do.	100	100	100	100	100
Phosphate rock, P_2O_5 equivalent		300,000	300,000	300,000	300,000	300,000
Salt, all types		500,000	500,000	500,000	500,000	500,000
Sulfur	thousand metric tons	42	42	42	42	42
Talc, soapstone, pyrophyllite		50,000	50,000	50,000	50,000	50,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, anthracite	thousand metric tons	24,100	25,060 [4]	36,000	41,000	41,000
Coke	do.	2,000	2,000	2,000	2,000	2,000

do. Ditto.

[1]Estimated data are rounded to no more than three significant digits.

[2]Table includes data available through August 30, 2012.

[3]In addition to the commodities listed, crude construction materials, such as sand and gravel and other varieties of stone, and refined petroleum products and rare earths presumably are produced, but available information is inadequate to make reliable estimates of output.

[4]Reported figure.

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TABLE 2
NORTH KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Cement	Sunchon Cement Complex	Sunchon, Pyongannam Province	3,000
Do.	Samgwong Cement Complex	Samgwong, Kangwon Province	2,500
Do.	Gomusan Cement Factory	Cheongjin, Hamgyongbuk Province	2,000
Do.	Cheonnaeri Cement Factory	Cheonae, Hamgyongnam Province	1,000
Coal	Anju Coal Mining Complex and Sunchon Coal Mining Complex	Anju, Kaechon, Pukchang, Sunchon, and Tokechon, South Pyongan (Pyongannam) Province; and North Pyongan (Pyonganbuk) Province	9,500
Do.	Saebyol Coal Mining Complex and Northern Coal Mine Enterprise	Saebyo, North Hamgyong (Hamgyongbuk) Province	6,000
Copper, mine output, Cu content	Hyesan Youth Copper Mine (51% owned by Luanhe Industrial Group and another unnamed Chinese company)	Hyesan, Yanggang Province	13
Gold, mine output, kilograms Au content	Gumsan (Kumsan) Joint Venture Co.	Sierra near Changjin northwest of Hamgyongbuk Province	530
Do. do.	Daebong Mine	Yanggang Province	150
Graphite	Yeongchon Graphite Mine (Joint venture of Korea Resources Corp. and Government of North Korea)	Yeongchon, Yonan County, South Hwanghae Province	3
Iron ore, concentrate, gross weight	Ministry of Metal and Machinery, Department of Mines, Musan Iron Ore Mine Complex	Near the town of Musan, Hamgyongbuk Province	10,000
Do.	Unryul Mine	Unryul, Hwanghaenam Province	1,000
Lead:			
In concentrate	Korea Zinc Industrial Group	Komdok, near Tancheon, Hamgyongnam Province	20
Refined	do.	Munpyong, Kangwon Province	32
Magnesite, concentrate, gross weight	Korea Magnesia Clinker Industry Group (KMCIG)	Daehung and Yongyang, Hamgyongnam Province; Paek Bai near Kim Chaeck, Hamgyongbuk Province	2,500
Magnesia clinker	Korea Magnesia Clinker Industry Group (KMCIG) and Quintermina AG	Danchon and Daehung, Hamgyongnam Province; Song Jin, Hamgyongbuk Province	1,200
Steel, crude			
Do.	Kim Chaek Iron and Steel Complex (Ministry of Metal and Machinery)	Chongjin, Hamgyongbuk Province	2,400
Do.	Hwanghae (Hwanghai) Iron Works	Songjin, North Hamgyong Province	1,500
Do.	Kangson Works	Kangson, Hwanhaebuk Province	960
Do.	Chollima Steel Works	Cholliam District, Nampo City, Pyungnam Province	760
Zinc:			
In concentrate	Korea Zinc Industrial Group	Komdok near Tancheon and Sankok near Kowon, Hamgyongnam Province; Nakyong, Hwanhaenam Province	80
Refined	do.	Munpyong, Kangwon Province; Tancheon, Hamgyongnam Province	100

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.

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The Mineral Industry of the Republic of Korea

By Lin Shi

The Republic of Korea is located in northeastern Asia between China and Japan and shares a border with North Korea. The country had limited mineral and energy resources for consumer goods and for its manufacturing sector and depended on imports of the raw materials for the production of processed mineral products. In 2011, the Republic of Korea's real gross domestic product (GDP) growth rate was 3.6%, and the inflation rate was 4%. The growth rate for mining and quarrying was –4.6%; the manufacture of nonmetallic mineral products, 1.9%; the processing of petroleum, coal, and chemicals combined, 4.3%; and the production of metals, 9.6%. The number of persons employed in the mineral industry decreased to 5,900 from 19,000 in 2010, and nominal wages in the mining and quarrying sector increased to 10.3% from 7.3% in 2010 (Bank of Korea, 2012, p. 20–29).

Minerals in the National Economy

The Republic of Korea's mining and quarrying sector was not a significant contributor to the country's economic development, accounting for only a 0.2% share of the GDP in 2011. Much of the country's mineral resource requirements were met through imports (Bank of Korea, 2012, p. 20–29).

Government Policies and Programs

In late 2011, the legislatures of the United States and the Republic of Korea approved a free trade agreement between the two countries and, on March 15, 2012, this free trade agreement entered into force. The purpose of the agreement is to boost the value of annual exports and increase export-related jobs in both countries (U.S. Department of State, 2012).

Production

In 2011, increases in mineral commodity production included that of mined lead (the output of which increased by 121% compared with that of 2010) and lead metal (30%); mined zinc (109%) and zinc metal (16%); ferrosilicomanganese (62%); pig iron (35%); mined silver (30%) and silver metal (27%); and steel (16%). Among the industrial minerals, the output of talc increased by 172%; diatomaceous earth, 134%; and salt, 67%. Decreases in production included that of cadmium metal, by 28%; sand, 26%; pyrophyllite, 24%; and feldspar, 23% (table 1).

Structure of the Mineral Industry

The Government—through the Ministry of Commerce, Industry and Energy—owned and supervised the country's coal mining, natural gas, petrochemicals, and petroleum refining companies. The rest of the mining, quarrying, and mineral processing companies were privately owned and operated (table 2).

Mineral Trade

There were significant flows of manufactured goods, services, and technology between the Republic of Korea and the United States. The Republic of Korea exported goods and services valued at $56.7 billion to the United States in 2011, which was an increase of 16% from the $48.9 billion in goods and services exported to the United States in 2010. These exports included $8.6 billion in passenger cars, $3.2 billion each in semiconductors and petroleum products (other than fuel oil), $2.2 billion in computer accessories, $1.2 billion in semifinished iron and steel products, and $570 million in iron and steel manufactured products. The Republic of Korea imported from the United States goods and services valued at $43.4 billion, which was an increase of 20% from the $38.8 billion imported from the United States in 2010. These imports included $3.5 billion in semiconductors, $1.6 billion in petroleum products (other than fuel oil), $1.4 billion in steelmaking materials, $750 million in precious metals, $749 million in nonferrous metals, $424 million in alumina and aluminum, and $264 million in copper (U.S. Census Bureau, 2012a, b).

Commodity Review

Metals

Copper.—The Republic of Korea did not produce copper ore and copper concentrate in 2011. The country imported 1.73 million metric tons (Mt) of copper ore and concentrate valued at about $5.6 billion in 2011, and it exported 38,883 metric tons (t) of copper concentrate. Stockpiled ore at the beginning of the year was 11,267 t and at the end of the year was 16,067 t. Domestic copper consumption in 2011 was 1.69 Mt. The country relied on imports to meet the raw material requirements for its copper smelters, which were located in Changhang and Onsan (Korea Institute of Geoscience and Mineral Resources, 2012, p. 7).

In 2011, LS-Nikko Copper Inc. was constructing the GRM recycling factory in the Maepo Agricultural and Industrial Complex at Danyang, Choongchungbuk-do. The Danyang factory would reportedly be able to recycle 17,600 t of copper (LS-Nikko Copper Inc., 2011).

Gold.—The country produced 49,550 kilograms (kg) of gold in 2011, of which 1,283 kg was produced from domestic ore. Imports of gold amounted to 32,433 kg and were valued at $1.61 billion; 63,044 kg of gold valued $3.07 billion was exported. There was 1,774 kg of gold in the national stockpile. A total of 32,892 kg of gold was consumed domestically to manufacture coins, dental products, electronic communication parts, jewelry, and semiconductor materials. Woulfe Mining Corp. of Canada was drilling to test the gold and silver mineralization on the Muguk gold-silver property, which was owned by Hangum Co. Ltd., in preparation for a preliminary

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economic assessment (Korea Institute of Geoscience and Mineral Resources, 2012, p. 7; Woulfe Mining Corp., 2012).

Iron Ore and Iron and Steel.—In 2011, domestic production of mined iron ore was about 542,000 t, and the country relied heavily on imports to meet its iron ore requirements. Imports of iron ore totaled 64.9 Mt and were valued at about $11 billion. Domestic iron ore consumption, which was consumed mainly by the country's steel manufacturing sector, was about 67 Mt. The country exported about 119,000 t of iron ore valued at about $6.5 million, and there was about 3 Mt in stockpile (Korea Institute of Geoscience and Mineral Resources, 2012, p. 7).

Manganese.—The Republic of Korea did not produce manganese in 2011. The country imported about 1.4 Mt of manganese ore, which was valued at about $369 million and barely met the domestic demand. The country had 4,000 t of manganese ore in stock and exported 44 t valued at $11,000 (Korea Institute of Geoscience and Mineral Resources, 2012, p. 7).

Tin.—Tin is a strategic metal in the Republic of Korea. The country imports 16,000 t of tin every year. Daewoo International was exploring a tin mine in Cameroon to acquire needed tin resources; the company held a 100% stake in this mine (Pohang Iron and Steel Co. Ltd., 2012).

Tungsten.—When Woulfe bought the Sangdong tungsten-molybdenum mine in 2009, the average price for tungsten was $18,000 per metric ton. Tungsten prices reached $44,000 per metric ton in 2011 as demand increased. The Sangdong tungsten-molybdenum mine is located on the east coast 187 kilometers from Seoul; it was expected to become the world's leading tungsten production site (including the mine and plant) and to account for 7% to 10% of global output when it commences production in 2013. Woulfe also owned 100% of the Chongyang tungsten mine and had three mining licenses for the mining area, which is located south of Seoul. Demand for tungsten, which was used to make wear-resistant abrasives and cutting machinery for the metalworking industry, was increasing rapidly (Hill, 2012; Woulfe Mining Corp., 2012).

Industrial Minerals

Cement.—According to the Korea Cement Association (KCA), the Republic of Korea exported 4.49 Mt of cement in 2011, which was an increase of 62% from the 2.77 Mt exported in the previous year. The KCA indicated that the low domestic demand for cement and sluggish construction markets had forced the cement companies into overseas markets to diversify their business portfolios (Global Cement, 2012).

Rare Earths.—In June, the Republic of Korea announced the discovery of a major deposit of rare-earth elements, which was estimated to be adequate to supply the country's domestic demand for rare earths for about 50 years. The Korea Institute of Geoscience and Mineral Resources analyzed the soil samples collected from 11 locations around the country and reported that there was 23 Mt of rare-earth minerals in deposits located in Chungju, North Chungcheong Province, and Hongcheon, Gangwon Province. The rare-earth minerals are hosted in iron ores. As of 2011, the Republic of Korea relied 100% on imports for rare-earth elements (KBS World, 2011).

Mineral Fuels and Related Materials

Natural Gas and Petroleum.—OAO Gazprom of Russia was under a contract to supply at least 1.5 Mt of liquefied natural gas to the Republic of Korea each year until 2025, and the volume was expected to increase greatly to meet the country's future energy needs. Gazprom sent gas to Japan directly through the Sakhalin-2 pipeline, but it had to send gas to the Republic of Korea by ship. The Government of Russia was in discussions with the Governments of North Korea and the Republic of Korea concerning a possible railway, gas pipeline, and power line from Russia to the Republic of Korea by way of North Korea (L'Agence France-Presse, 2011; Blank, 2012).

Uranium.—Stonehenge Metals Ltd. of Australia is engaged in the exploration of uranium in the Republic of Korea and was focusing on its 100%-owned Daejon project in the areas of Chubu, Kolnami, and Yokwang, where the uranium deposits are located. The company had also identified significant vanadium mineralization at the site. Wolfe owned the Ogshon uranium project; the project is located within the Okcheon metamorphic belt, which extends through the middle of the country. Woulfe had been granted five registered mining rights (RMRs) and four mining applications (MAs) in the Daejeon-Geumsan area. Korea Resources Corp. conducted the U_3O_8 resource drilling program for Woulfe in Daejeon 29, Daejeon 39, and Daejeon 48. Woulfe had also been granted one RMR and two MAs in the Miwon area, and the company's sampling and testing programs were in process (Australia's Paydirt, 2012, p. 71; Woulfe Mining Corp., 2012).

Outlook

The Republic of Korea's GDP was mainly dependent on exports. The Bank of Korea projected that the country's economy would grow by approximately 3.8% in 2012. The country's 2012 export volume is expected to decrease slightly based on forecasts of global economic conditions. Domestic demand, however, is projected to remain relatively steady as real purchasing power increases owing to improved working conditions and stable oil prices (Bank of Korea, 2012, p. 14–17).

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TABLE 1
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011
METALS						
Bismuth, metal		267	210	300	498	480
Cadmium, smelter		2,846	3,090	2,500	4,166	3,005
Copper:						
Mine output, Cu content		6	4	14	9	--
Metal:						
Smelter, primary and secondary		515,000	544,000	499,200	NA [r]	NA
Refined, primary and secondary		581,467	537,925	531,701	564,600	595,447
Gold:						
Mine output, Au content	kilograms	162	175	274	235	209
Metal, refined	do.	47,078	37,989	51,186	54,540	49,550
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand metric tons	291	366	455	513	542
Fe content	do.	163	205	274 [r]	308	320
Metal:						
Pig iron	do.	29,437	31,043	27,475	31,228	42,213
Ferroalloys:						
Ferromanganese		209,321	251,125	--	286,259 [r]	355,047
Ferrosilicomanganese		105,607	76,184	--	120,779 [r]	195,650
Total		314,928	327,309	--	407,038 [r]	550,697
Steel, crude	thousand metric tons	51,517	53,493	48,572	58,914 [r]	68,519
Lead:						
Mine output, Pb content		12	449	2,064	1,168	2,577
Metal, smelter		195,022	244,137	216,918	197,900	256,851
Nickel:						
Ferronickel		--	2,506	21,609	20,000 [e]	20,000 [e]
Metal		28,675	28,653	NA	NA	NA
Silver:						
Mine output, Ag content	kilograms	1,400	--	--	2,025 [r]	2,649
Metal	do.	1,393,935	1,461,886	1,740,078	1,735,535 [r]	2,197,409
Zinc:						
Mine output, Zn content		4,067	3,672	3,672	710	1,486
Metal, primary		670,000	738,000	751,179	717,100	828,735

See footnotes at end of table.

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TABLE 1—Continued
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	52,182	51,653	50,127	47,420 r	48,300
Clays, kaolin	do.	688	955	659	764	799
Diatomaceous earth		2,360	2,540	2,440	2,200	5,150
Feldspar		398,513	344,257	622,700	496,511	384,221
Graphite, all types		52	73	48	34	--
Lime, slaked lime e		3,900,000	4,000,000	NA	NA	NA
Mica, all grades		42,385	49,474	27,078	36,486	NA
Salt		249,515	384,304	382,270	222,509	372,230
Soda ash, manufactured e		-- r	-- r	-- r	-- r	--
Stone, sand and gravel:						
Limestone	thousand metric tons	82,655	83,469	77,923	79,625	82,368
Quartzite	do.	3,511	3,325	3,536	3,603	3,603
Sand, including glass sand	do.	22,227	1,757	455	535	394
Sulfur, byproduct: e						
Metallurgy	do.	670	660	600	480 r	480
Petroleum	do.	1,000	900	900	720 r	720
Total	do.	1,670	1,560	1,500	1,200 r	1,200
Talc and related materials:						
Pyrophyllite		798,054	892,625	617,411	673,936	510,708
Talc		9,557	6,438	5,996	5,729	15,608
Zeolites		157,408	217,691	235,226	242,190	231,420
MINERAL FUELS AND RELATED MATERIALS						
Carbon black e		497,191 2	484,000	500,000	500,000	500,000
Coal, anthracite	thousand metric tons	2,886	2,773	2,519	2,500 e	2,500 e
Fuel briquets, anthracite briquets e	do.	2,400	2,320	2,000	2,000	2,000
Petroleum, refinery products 3	thousand 42-gallon barrels	770,523	747,827	750,000	750,000 e	750,000 e

eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. rRevised. do. Ditto. NA Not available.
-- Zero.

[1]Table includes data available through October 24, 2012.

[2]Reported figure.

[3]Includes bunker oil C-type, diesel oil, gasoline, kerosene, liquefied petroleum gas, and naphtha.

Sources: Ministry of Commerce, Industry and Energy, Korea Institute of Geoscience and Mineral Resources, 2011 supply and demand balance by mineral, p. 9; U.S. Geological Survey Minerals Questionnaires 2007–11. World Bureau of Metal Statistics, December 2011. The Bank of Korea Monthly Statistical Bulletin, table 41, Exports by principal commodity, and table 42, Imports by principal commodity, May 2011, p. 132–135.

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TABLE 2
REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bismuth, metal	metric tons	Korea Zinc Co. Ltd.	Onsan refinery	500
Cadmium	do.	do.	do.	2,100
Do.	do.	Young Poong Corp.	Sukpo refinery	2,100
Cement		Ssangyong Cement Industrial Co. Ltd.	Plants at Tonghae, Kwang Yang, Munkyung, Pukpyong, and Yeongwol	15,040
Do.		Sung Shin Cement Manufacturing Co. Ltd.	Tanyang plant	13,700
Do.		Tong Yang Major Corp.	Plants at Pukpyong and Samchok	11,580
Do.		Lafarge Halla Cement Corp.	Plants at Kwang Yang and Okkye	9,500
Do.		Hyundai Cement Co. Ltd.	Plants at Tanyang and Yongwol	8,600
Do.		Hanil Cement Manufacturing Co.	Plants at Chungbuk and Tanyang	7,200
Do.		Asia Cement Manufacturing Co. Ltd.	Plants at Daegu and Jaechon	4,600
Coal		Korea Coal Corp.	Mines at Changsung, Dogae, and Hwasoon	2,000
Copper, metal, primary		Korea Zinc Co. Ltd.	Onsan	20
Do.		LS-Nikko Copper Inc.	Changhang	60
Do.		do.	Onsan	510
Gas, natural		Korea National Oil Corp.	Ulleung Basin	NA
Gold:				
In concentrate	kilograms	Hangum Co. Ltd.	Muguk Mine, Haenam, Jeonnam (South Cholla) Province	1,600
Refined	do.	Korea Zinc Co. Ltd.	Onsan	50,000
Do.	do.	LS-Nikko Copper Inc.	do.	60,000
Graphite		Kaerion Graphite Ltd.	Kangwon	NA
Do.		Wolmyong Mining Co.	do.	NA
Indium, metal	kilograms	Korea Zinc Co. Ltd.	do.	55,000
Iron ore		NA	Mines at Sinyemi, Gangwon Province	300
Lead, metal, primary		Korea Zinc Co. Ltd.	Kangwon	200
Magnesium		Pohang Iron and Steel Co. Ltd.	Magnesium refinery plant, Gangneung City, Gangwon Province	10
Do.		do.	Magnesium metal sheet plant, Suncheon City, Jeonnam (South Jeolla) Province	3
Molybdenum	metric tons	Korea Resources Corp.	Mine at Uljin; Smelter at Yeosu, Jeonnam (South Jeolla) Province	6,000
Do.	do.	NMC Resource Corp.	Moland Mine, at Daejang-ri, Geumseongmyeon, Jecheon-si, Chungcheongbuk-do District	2,000
Nickel:				
Metal		Korea Nickel Corp.	Onsan nickel refinery	48
Ferronickel		Pohang Iron and Steel Co. Ltd.	Gwangyang ferronickel plant	30
Petroleum, refinery products	thousand 42-gallon barrels per day	SK Corp.	Ulsan	817
Do.	do.	LG-Caltex Corp.	Yocheon (Yosu)	650
Do.	do.	Hyundai Oil Refinery Co.	Daesan and Inchon	589
Do.	do.	S-Oil Corp.	Onsan	520
Pyrophyllite		NA	Wan-Do, Sungsan, Hwansan, Okmesan, Dae-Do, and Chin-Do Mines in Haenam	446
Do.		NA	Nilyang, Yangsan, Kimhae, Pusan, and Kyong-Nam Mines in Dong-Nae	446
Silver:				
In concentrate	kilograms	Hangum Co. Ltd.	Haenam, Jeonnam (South Cholla) Province	3,700
Refined	metric tons	Korea Zinc Co. Ltd.	Onsan	1,000
Do.	do.	LS-Nikko Copper Inc.	do.	370

See footnotes at end of table.

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TABLE 2—Continued
REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Steel, crude	Pohang Iron and Steel Co. Ltd.	Kwangyang (Gwangyang) Works	15,000
Do.	do.	Pohang Works	13,000
Do.	Hyundai Steel Co. Ltd.	Inchon Plant	4,800
Do.	do.	Pohang Plant	3,200
Do.	Dongkuk Steel Mill Co. Ltd.	Inchon Works	1,450
Do.	do.	Pohang Works	3,600
Do.	Korea Iron and Steel Co. Ltd.	Masan and Changwon Works	1,200
Talc	IL Shin Industrial Co. Ltd.	Choong Ju, Chungbuk Province	160
Do.	Korea Zinc Co. Ltd.	Onsan	430
Do.	Young Poong Corp.	Sukpo	280
Zinc	Korea Zinc Co. Ltd.	Onsan refinery	445
Do.	Young Poong Corp.	Sukpo refinery	303

Do., do., Ditto NA Not available.

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THE MINERAL INDUSTRY OF LAOS

By Yolanda Fong-Sam

In 2011, Laos produced a variety of mineral commodities. These included tin, gypsum, and refined copper, of which production increased by about 83%, 24%, and 23%, respectively, compared with that of 2010. On the other hand, significant decreases in production were reported for silicon (61%), barite (29%), and gold (21%) (table 1).

In 2011, Sinohydro Group Ltd. of China signed a $2 billion framework agreement with the Government of Laos to build seven dams along 475 kilometers (km) of the Nam Ou River, which is a Mekong River tributary. The agreement covered the initial stages of the project, which included the planning and discussion of the terms and conditions for the construction of the dams and not the actual construction of the structures. The agreement is part of the country's broader plan to build a total of 12 hydropower dams along the Mekong River, which is shared with neighboring countries Cambodia, Thailand, and Vietnam. Vietnam was publicly opposed to the construction of any dam along the Mekong River, citing irreparable environmental damage and the threat to the livelihood of the population living next to the river. The first of the 12 proposed hydropower dams, the Xayaburi, which was projected to cost $3.5 billion, was to be built under an agreement with Thailand, which would purchase most of the electricity generated from the 1,260-megawatt (MW)-capacity powerplant. In April, various ethnic minority groups living along the Mekong River in Cambodia petitioned the Government of Laos to stop construction of the Xayaburi Dam because of concerns similar to those expressed by their Vietnamese counterparts. In May, the Government of Laos announced that it would suspend work on the Xayaburi Dam until a thorough review of the environmental impact assessment was completed (Bangkok Post, 2011; International Work Group for Indigenous Affairs, 2011; Khmernz.blogspot.com, 2011; Sophirom.wordpress.com, 2011; Voice of America, 2011).

As of 2011, Laos had 14 hydroelectric powerplants with a total production capacity of 2,540 MW and the potential to increase the country's capacity to a total of 26,000 MW. According to the Government, 17 hydroelectric powerplants were in various planning stages, and an additional 45 plants were under feasibility study (Lao Voices, 2011a, c).

In February, the Government of Laos approved the construction of the Xekaman 1 hydroelectric powerplant, which was planned to start construction in mid-2011. The project was projected to cost $441 million and would be located in the southern Province of Attapeu in the Xekaman River (Xanxay district). The Xekaman 1 Power Co., which was a joint venture between Electricite du Laos (EDL) and Viet-Lao Power Joint Stock Co., signed a 30-year concession agreement with the Government of Laos. When commissioned in 2015, the plant would have an annual capacity to produce 1.22 billion kilowatthours of electricity, of which 80% would be exported to neighboring Vietnam and the remainder would be consumed locally. As part of its strategy to expand the country's power generation potential, the Government signed two memorandums of understanding; one with Thailand to provide 7,000 megawatthours of electricity per year after 2015, and another with Vietnam to provide 3,000 megawatthours per year of electricity starting in 2011 until 2020 (Lao Voices, 2011c).

Government Policies and Programs

The mining sector in Laos is governed by the Mining Law of 2008, which has been in the implementation stages since the law's adoption, and mining projects have been under a moratorium imposed by the Government since 2009. Since the moratorium went into effect, no new mining licenses have been issued. The moratorium was implemented as details emerged on licensed projects that had been inactive for an extended period of time and findings that mining operations were causing environmental damage and raising social concerns. The Government estimated that it would start granting new licenses between 2013 and 2014, once an effective monitoring system is implemented in the country (Lao Voices, 2011b; Mining Journal Online, 2011).

The Mining Law of 2008 establishes the requirements for obtaining a mining license to develop a mineral project. The Department of Mines issues the mining licenses. The Department of Geology and the Department of Mines jointly oversee the implementation of Laos's Mining Law, which includes inspecting and monitoring mineral development activities in the country; they also assist in the negotiation of mining contracts and in mineral exploration and mining licensing activities, promote investment in the mining sector, maintain geologic databases, and provide mineral exploration support and data analyses (Department of Geology and Mines of Laos PDR, 2010a, b).

Structure of the Mineral Industry

As of mid-2011, a total of 152 mining companies were operating in Laos, of which 70 were locally owned and 82 were foreign enterprises (no information was available as to whether they were joint ventures or wholly foreign owned). Over the past few years, the Government has authorized mining companies to operate on 256 mining concessions across the country (Lao Voices, 2011b). Laos has a variety of undeveloped mineral resources, and the Government has recognized mining as a critical sector of the economy and continued to support the development of the sector by promoting domestic and foreign investment. In 2011, the significant producers of copper, gold, and silver in Laos were the Australian companies Minerals and Metals Group Lane Xang Minerals Ltd. (MMG LXML) and PanAust Ltd. The country's major mineral industry facilities are listed in table 2.

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Commodity Review

Metals

Bauxite and Alumina.—The Laos Bolaven Plateau bauxite project, which is located in the southern part of the country, was being developed by Sino Australian Resources (Laos) Co., Ltd. (SARCO), which was a joint venture between China Nonferrous Metals Industry's Foreign Engineering and Construction Co., Ltd., of China (51%) (NFC) and ORD River Resources Ltd. of Australia (49%). SARCO had two tenements in the property for a total of 487 square kilometers (km²). They were the LSI tenement, which covered a 66-km² area, and the Yuqida tenement, which covered a 421-km² area. As of early 2011, the measured resource for the two tenements was estimated to be 69 million metric tons (Mt) at grades of 32% alumina and 2% silica content. In May, SARCO was in talks with investors to raise about $200 million in equity and was finalizing plans for the construction of a 600,000-metric-ton-per-year (t/yr)-capacity alumina refinery in the country. In June, SARCO and NFC signed a memorandum of understanding for the construction of the alumina refinery, which had a total investment value of $600 million. In October, ORD River Resources upgraded the Joint Ore Reserves Committee (JORC) resource estimate for the LSI tenement to 77 Mt of bauxite from the previous estimate of 19 Mt. The silica content of the ore remained at about 2.3%. The company was in the process of completing the necessary analysis to revise the estimation of the Yuqida tenement resource (ORD River Resources Ltd., 2011a, p.1; 2011b, p. 1–2; 2011c, p. 9; 2012).

In April, Aluminum Corporation of China (Chinalco) announced that it had signed an agreement with a state-owned service firm in Laos to develop mineral resources in the country, although no additional details were released. Chinalco was diversifying its mining business to include other commodities, such as coal, copper, iron ore, and rare earths. The company's presence in Laos included a subsidiary of Chinalco—the Yunnan Copper Industry Group Co. Ltd. (YCI)—which was developing a copper project in the country (Thomson Reuters, 2011).

Copper, Gold, and Silver.—In March, Chinalco Yunnan Copper Resources Ltd. (CYU), formerly known as China Yunnan Copper Australia Ltd., signed an agreement to acquire a 51% interest in Yunnan Copper Sanmu Mining Ltd. (Sanmu Mining) from China at a cost of $2.8 million. Sanmu Mining held 100% interest in four copper and silver projects in northern Laos within the Mohan development zone. The most advanced developments included the Jiuzhai project (which covered an area of 31 km² in Oudumaxai Province) and the Xinzhai project (which covered an area of 140 km² in Phongsali Province). Both projects were estimated to contain between 30 and 200 grams per metric ton (g/t) of silver and 1.3% copper. The other two projects were the Modeng and the Nadao deposits, which were in earlier stages of development. The company was planning to start mining operations in all the properties by 2013. In July, CYU announced that it had signed a joint-venture agreement with YCI to invest $2 million in drilling and development projects in Laos (Australia's Paydirt, 2011; Chinalco Yunnan Copper Resources, undated).

In 2011, the Sepon copper-gold project produced a total of 78,859 t of copper cathodes and 2,317 kilograms (kg) of gold, which represented an increase of about 23% for copper and a decrease of about 29% for gold, respectively, compared with production in 2010. The increase in copper production was owing mainly to the new expansion in the Sepon copper plant that increased production to 80,000 metric tons per year (t/yr) from 65,000 t/yr. The expansion project was commissioned in December 2010. On the other hand, the decrease in gold production was caused by a combination of factors that included an intense tropical storm season, a decrease in ore availability in the Houay Yeng gold pit, and lower gold grades encountered. In late 2011, the oxide gold ore supply in Sepon was projected to be depleted by 2013. The Sepon project was operated by MMG LXML, which was a joint venture between Minmetals Resources Ltd (90%) and the Government (10%) (Minmetals Resources Ltd., 2011, p. 10, 12; MMG Ltd., undated).

PanAust, through its wholly owned subsidiary Pan Mekong Exploration Pty. Ltd., owned a 90% interest in the Lao-registered company Phu Bia Mining Ltd. (PBM) (which managed the Phu Kham copper-gold operation), and the Government owned the remaining 10%. The Government and PBM had a mineral exploration and production agreement that regulated exploration and mining within the company's contracted 2,636-km² area. In 2011, the Phu Kham copper-gold operation, which is located approximately 120 km north of the capital city of Vientiane, had produced 59,897 t of copper concentrate, which was a decrease of 11.7% compared with that of 2010 (table 1). The mine also produced 1,667 kg of gold, which was a decrease of about 8% compared with the 1,809 kg produced in 2010; and 16,738 kg of silver, which was an increase of 6% compared with the 15,788 kg of silver produced in 2010. The decrease in copper and gold production was mainly caused by extreme weather conditions during 2011. The Phu Kham upgrade project was underway and was expected to be completed by mid-2012. The upgrade, which had an estimated cost of $95 million, was expected to increase the ore processing rate of the facility to 16 million metric tons per year (Mt/yr) from 12 Mt/yr (PanAust Ltd., 2011, p. 10, 14).

PanAust's interests in Laos also included the Ban Houayxai gold-silver project and the Phonsavan copper-gold project. During 2011, the Ban Houayxai project was under construction after the Government of Laos issued PanAust the permits to start construction in 2010. The Ban Houayxai project, which is located approximately 25 km west of the Phu Kham copper-gold operation, was expected to be commissioned by spring 2012 and to have a production capacity of more than 3,100 kilograms per year (kg/yr) of gold (reported as 100,000 troy ounces), and about 21,800 kg/yr of silver (reported as 700,000 troy ounces) when fully operational. The operation was estimated to have a mine life of 9 years (PanAust Ltd., 2011, p. 12).

The Phonsavan copper-gold project consisted of two copper deposits named KTL and Tharkhek, which are located within 5 km of each other. In 2011, drilling in the KTL deposit defined an estimated mineral resource of 89 Mt grading 0.44% copper and 0.18 g/t gold (PanAust Ltd., 2011, p. 14).

Zinc.—During 2011, Padaeng Industry Public Co. Ltd. of Thailand, through its wholly owned subsidiary Padaeng Industry

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(Laos) Co. Ltd., continued its zinc exploration in a 400-km² area in Vientiane Province. The company focused on two prospects where zinc resources had been identified: the Pha Vang Sam and the Tham Noi Zinc. In December, the company estimated the mineral resources for the two prospects to be about 890,000 t at a grade of 9% zinc and 1.9% lead (Padaeng Industry Public Co. Ltd., 2011, p. 15).

Industrial Minerals

Cement.—In March 2011, Lao Cement Co. Ltd. faced constant shortages of coal; therefore, it proposed to the Government that investors be allowed to prospect for coal to ease the shortage being faced by the cement industry. Otherwise, the cement factories would have to resort to importing coal, which would be expensive and could possibly result in increased cement prices. The company suggested that, to satisfy Laos's demand for cement, the country should produce at least 2 Mt/yr of cement; however, the combined annual production capacity from the six cement factories currently in operation in the country was only about 1.5 Mt/yr. Lao Cement planned to build a third cement plant in Vang Vieng with the capacity to produce from 0.7 to 1 Mt of cement; the plant was expected to be commissioned by 2013. Another cement factory was also under construction in the Province of Saravane; this facility was expected to be commissioned later in the year, with a capacity to produce 0.5 Mt/yr of cement (Cemnet.com, 2011).

Potash.—In October 2011, the China-ASEAN Fund (CAF) on investment cooperation announced that it had invested $50 million for the development of a potash ore mine in Laos. The investment was for the acquisition of a stake in Asian Potash Corp. Ltd., which was an investor in the Laos potash ore mine located in Khammouane Province. The first phase of the mine, which would have the capacity to produce an estimated 500,000 t /yr of potash, was expected to be commissioned during the first quarter of 2012. When completed, the mine (which was valued of $1.25 billion) was expected to have a total annual production capacity of 3 Mt of potash (ChinaDaily.com, 2011).

Outlook

As Laos continues to develop its infrastructure and create business ties with neighboring countries, its demand for construction materials, fertilizers, metals, and fuel minerals is expected to increase to meet local demand and the growing demand from regional and global markets. Laos, with its high potential for hydroelectric power and mining that has attracted Chinese investors to the country, was mostly interested in investing in infrastructure projects, such as a high-speed rail to link the Chinese border to Vientiane, and to collaborate in the construction of dams to produce hydroelectric power (Lao Voices, 2011a). During 2011, and following the trend of recent years, Laos increased its partnerships with Asian countries, such as China, for the exploration of bauxite, copper, and potash; Laos also partnered with Thailand in the operation of the biggest hydroelectric dam in the country and the development of the zinc industry. Laos's participation in such projects enhances its economic development and economic cooperation with other southeast Asian countries.

In 2012, copper cathode production at the Sepon project is expected to reach full capacity of 80,000 t/yr when the expansion commissioned at the end of 2010 is completed. Gold production in Sepon is expected to stay at about 3,500 kg/yr for 2012. Production of copper concentrates in the Phu Kham project is expected to remain at 70,000 t/yr during 2012. PanAust expects its gold and silver production to increase in 2012 following the commissioning of the Ban Houayxai project. Increases in the production of potash are also expected within the next few years as mines and plants that were in construction during 2010 and 2011 are completed.

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TABLE 1
LAOS: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
Barite		29,000	29,000	29,000	17,500 r,4	12,400 4
Cement		400,000	400,000	400,000	400,000	400,000
Clay		5,500	5,500	5,500	5,500	5,500
Coal, lignite		620,000	600,000	600,000	501,600 r,4	511,700 4
Copper:						
Concentrate		--	24,929 4	54,019 4	67,806 4	59,897 4
Metal, refined[4]		62,541	64,075	67,561	64,241	78,859
Gemstones, sapphire	carats	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Gold[4]	kilograms	5,137	4,333	5,033	5,061	3,984
Gravel		120,000	120,000	120,000	120,000	120,000
Gypsum		775,000	775,000	775,000	553,300 r,4	686,100 4
Lead, mine output		NA	NA	NA	2,710 4	2,721 4
Limestone		750,000	750,000	750,000	750,000	750,000
Salt, rock		35,000	35,000	35,000	32,200 r,4	35,100 4
Sand, construction materials		100,000	100,000	100,000	100,000	100,000
Silicon, metal[4]		--	3,026	7,350	7,768	3,001
Silver[4]	kilograms	4,500	6,700	14,726	15,788	16,738
Tin, mine output, Sn content[5]		370	450	240	410 r,4	750 4
Zinc, mine output, Zn content		3,000	2,200	3,400	5,000 r,4	4,320 4

rRevised. NA Not available. -- Zero.
[1]Estimated data are rounded to no more than three significant digits.
[2]Table includes data available through January 10, 2013.
[3]In addition to the commodities listed, crude construction materials, such as sand and gravel, and varieties of stone were produced irregularly.
[4]Reported figure.
[5]Estimated figures based on Laos inferred exports of tin ores to China, Thailand, and Vietnam.

Sources: U.S. Geological Survey Minerals Questionnaire for Laos (2007); Oxiana Ltd. Annual Reports 2007–08 and Quarterly Reports 2007; Pan Australian Resources Ltd., Annual Report 2009–11 and Quarterly Reports 2007; Minerals and Metals Group Lane Xang Minerals Ltd. (MMG LXML) Quarterly Reports 2009–11; World Metal Statistics, December 2010.

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TABLE 2
LAOS: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Barite		Barite Mining Co., Inthavong Mining Co., Lao Development Construction Co., Phethongkham Co., Oravan Barite Co., and Singphooufar Co.	Muongfuong and Sanakham, Vientiane Province	30,000 [1]
Cement		Lao Cement Co. Ltd., a joint venture between China Yunnan Corp. for International Techno-Economic Cooperation and Lao State Agricultural Industy Development Enterprise Imp-Exp & General Service	Vangvieng Cement Plant No. II	250,000
Do.		Wanrong Cement I	Vangvieng, Vientiane Province	78,000
Do.		Wanrong Cement II (Yuannan Industrial Economic Co., 60%, and Agricultural and Forestry Development and Service Co. of Laos, 40%)	do.	200,000
Do.		Wanrong Cement III	Savannakhet Province	200,000
Coal:				
Anthracite		Agriculture Industry Development Enterprises	do.	60,000
Lignite		Viengphoukha Coal Mine Co. Ltd.	Viengphoukha, Luangnamtha Province	300,000
Copper:				
Mined ore output, Cu content		Minerals and Metals Group Lane Xang Minerals Ltd. (MMG LXML), 90%, and Government, 10%	Sepon, Vilabouly District, Savannakhet Province	80,000
Refined		do.	do.	80,000
Do.		Phu Bia Mining Ltd. (wholly owned subsidiary of PanAust Ltd.), 90%, and Government, 10%	Phu Kham copper-gold operation located in Xaisomboun special zone, 120 kilometers north of Vientiane, Vientiane Province	65,000
Gemstone, sapphire	carats	Bokeo Mining Co. Ltd.	Bokeo Province	300,000
Do.	do.	Buhae Industrial Corp.	Houaxay District, Bokeo Province	500,000
Do.	do.	Lao International Trade and Service	do.	400,000
Gold, mine output, Au content	kilograms	Minerals and Metals Group Lane Xang Minerals Ltd. (MMG LXML), 90%, and Government, 10%	Sepon, Vilabouly District, Savannakhet Province	7,500
Do.	do.	Phu Bia Mining Ltd. (wholly owned subsidiary of PanAust Ltd.), 90%, and Government, 10%	Phu Kham copper-gold operation located in Xaisomboun special zone, 120 kilometers north of Vientiane, Vientiane Province	1,700
Gypsum		Lao State Gypsum Mining Co. Ltd.	Champhon District, Savannakhet Province	200,000
Do.		Mining Development Economy Cooperation (OEDCD)	Tha Kect District, Khammouane Province	150,000
Do.		Savan Gypsum Mining Co. Ltd.	Champhon District, Savannakhet Province	70,000
Do.		LAVICO Co. Ltd. (a Laos-Vietnam joint venture)	Xebangfay District, Khammouane Province	100,000
Limestone		Laos Cement Co. Ltd. (a Laos-China joint venture)	Vangvieng, Vientiane Province	250,000
Do.		Agriculture Industry Development Enterprises	do.	150,000
Do.		V.S.K. Co. Ltd.	Tha Kect District, Khammouane Province	150,000
Do.		Phanangnon Co. Ltd.	do.	100,000
Potash		SinoAgri Mineral Resources Exploration Ltd. (a joint venture between Beijing Jiang Zhi Yuan Investment Ltd. and China National Agricultural Means of Production Group Corp.)	Plant in Sakhon Nakon Basin in the Khammouane Province	100,000
Do.		Laotian Potash Mining Industry Ltd. Co.	Potassium chloride plant	50,000
Silver	kilograms	Phu Bia Mining Ltd. (wholly owned subsidiary of PanAust Ltd.), 90%, and Government, 10%	Phu Kham copper-gold operation located in Xaisomboun special zone, 120 kilometers north of Vientiane, Vientiane Province	14,000
Tin, mine output, Sn content		Lao-North Korea Tin Mines	Hinboune District, Khammouane Province	120
Do.		S V Mining Co. Ltd.	do.	300

See footnotes at end of table.

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TABLE 2—Continued
LAOS: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Zinc, mine output, Zn content	Padaeng Industry Public (Laos) Co. Ltd. [Majority interest owned by Padaeng Industry (Public) Co. Ltd., and minority interest owned by the Government]	Kaiso, Vangvieng, Vientiane Province	5,000

[e]Estimated. Do., do. Ditto.
[1]Estimated combined capacity of the six local barite mining companies.

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The Mineral Industry of Malaysia

By Pui-Kwan Tse

Malaysia's economy was dependent on exports of manufactured goods and on the service sector. The slow recovery in the world economy affected the Malaysian economy, which grew at a moderate pace in 2011. The country's gross domestic product (GDP) increased by 5.1% compared with an increase of 7.2% in 2010. Malaysia's economic growth was driven mainly by domestic demand (business and household spending). Private investment increased by 6.9% and accounted for the major share of the GDP growth. Private consumption strengthened, especially as a result of spending by civil servants, who received a 1-month bonus during the second half of the year. In rural areas, households benefited from higher rubber and palm oil prices. The manufacturing sector grew by only 4.5% as demand weakened for manufactured products in most of the industrialized countries in the Western Hemisphere. Electrical and electronic products were Malaysia's major export commodities; the volume of these exports decreased by 2.4%. Exports of chemical and petroleum products, on the other hand, increased by 7.4% in 2011. The output value of the mining and quarrying sector contracted by 5.7% as a result of the decrease in output of crude oil and condensates. Owing to Government-initiated fiscal stimulus projects in 2010, the output of the construction sector increased by 3.5% (Bank Negara Malaysia, 2012, p. 15–31).

Minerals in the National Economy

Malaysia had identified mineral resources of barite, bauxite, clays, coal, copper, gold, ilmenite, iron ore, monazite, natural gas, petroleum, silica, silver, struverite (tantalum), tin, and zircon. During the 20th century, mineral production played an important role in Malaysia's national economy; after many years of exploitation, however, such minerals as barite, bauxite, copper, ilmenite, iron ore, and tin were either depleted or the capacities to produce them had decreased significantly in recent years. In terms of its contribution to the country's economy, the mining and quarrying sector accounted for 6.3% of the GDP in 2011 compared with 8.8% in 2006. A total of 19,297 people were employed in the mining and quarrying sector in 2010 (the latest year for which data were available) (Department of Statistics, 2011; 2012a; 2012b, p. v).

Government Policies and Programs

In Malaysia, the mineral activities are governed by the Mineral Development Act 1994 and the State Mineral Enactment. The Mineral Development Act 1994 defines the power of the Federal Government to regulate mineral exploration, mining, and related activities, including the authority to conduct inspections. The State Mineral Enactment gives the States the power to issue mineral prospecting and exploration licenses and mining leases. Apart from paying a corporate tax to the Federal Government, mine and quarry operators are required to pay value-based royalties to the State in which their operation is located. Royalty rates depend on the mineral commodity and on the assessment of each of the individual States.

Low or zero import duties are applicable for most minerals. Import duties can be waived for certain mineral processing equipment. The Malaysian Investment Development Authority also provides incentives for certain minerals that are used for processing and manufacturing products.

Production

Malaysia produced bauxite, coal, feldspar, gold, ilmenite, iron ore, mica, natural gas, petroleum, struverite (tantalum), tin, and zircon. Malaysia had been one of the major tin-producing countries in the world; owing to depleted reserves and lower ore grades, however, tin concentrate production had decreased in recent years. The country depended on imported tin concentrates and crude tin mainly from Australia and Indonesia to meet its demand for feedstocks for its smelter and refinery. In 2011, production of such commodities as bauxite, coal, gold, ilmenite, iron ore, rutile, tin, and zirconium increased by more than 10% whereas production of barite, feldspar, kaolin, and manganese decreased by more than 10% (table 1).

Structure of the Mineral Industry

Malaysia's mineral industry consisted of a small mining sector of coal and ferrous and nonferrous metals. Metallic and nonmetallic mineral processing facilities were operated by private companies incorporated in Malaysia. Oil and gas exploration, production, and processing activities were owned and operated by Petroliam Nasional Berhad (Petronas), which was a state-owned company, and by joint ventures of Petronas and foreign companies. Foreign investors were permitted to have 100% equity stake in companies operating in Malaysia or to form joint ventures with local companies (table 2).

Mineral Trade

The major export products were automotive parts, chemicals, electronics, and machinery. The volume of mineral commodity exports had declined in recent years. In 2011, the total trade increased to $410.1 billion; of that amount, exports increased by 9.2% to $225.1 billion and imports increased by 8.5% to $185.0 billion. Electrical and electronic products continued to be Malaysia's leading export category and accounted for 34.1% of the total exports. The category palm oil and palm oil based products was the second leading export revenue category and accounted for 12.0%. The export share of liquefied natural gas (LNG) and petroleum products was 7.2% and 4.8%, respectively. Malaysia exported 24.8 million metric tons (Mt) of LNG, which was an increase of 8.2% from that of 2010. The country exported 12.5 Mt of crude oil, which had a total value of $10.2 billion, or 4.0% of the total exports. Malaysia's

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crude oil was exported to (in descending order of export value) China, Singapore, Japan, the European Union, the United States, Thailand, Hong Kong, India, the Republic of Korea, and Australia and accounted for 77% of the country's total exports in 2011. Malaysia's major import product category was machinery and transport equipment, which accounted for 44.6% of the total imports. China continued to be Malaysia's leading trading partner in 2011 (Department of Statistics, 2012a).

Commodity Review

Metals

Aluminum.—Malaysia did not have an aluminum refinery or smelter; most of its bauxite output, therefore, was exported to other Asian countries, and Malaysia imported unwrought aluminum to meet its demand. Press Metal Sarawak Sdn Bhd (a subsidiary of Press Metal Berhad) completed the construction of a 120,000-metric-ton-per-year (t/yr) aluminum smelter in Mukah in the State of Sarawak; the smelter was fully operational by yearend 2010. Press Metal had chosen the Aluminum Corp. of China Ltd. (Chalco) as its technical partner for the first phase of the $300 million aluminum smelter project. Chalco's Guiyang Aluminum and Magnesium Research Institute installed the GY–200 aluminum smelting technology, which was equipped with 208 210-kiloampere prebaked cells. The company signed a memorandum of understanding with Sarawak Energy Berhad to supply 510 megawatts (MW) of electricity-generating capacity for the smelter by 2010. After the smelter was fully operational, the company started the construction of its second potline, which would double the smelter's output capacity. The second potline was scheduled to be completed in 2012 and would be fully operational in about 18 months. Sumitomo Corp. of Japan acquired a 20% share in the aluminum project and had sales rights to some of the output. Sumitomo would have the option to obtain an additional 5% interest in Press Metal Sarawak. Press Metal intended to add another potline to the smelter (China Metal Bulletin, 2012).

In 2008, the Government gave its approval for Sarawak Aluminium Co. (SALCO), which was a joint venture between Malaysian Cahya Mata Sarawak Berhad (CMS) and Rio Tinto Alcan (a subsidiary of Rio Tinto Ltd. of Australia), to build an aluminum smelter in Similajau, which is located about 60 kilometers (km) from the town of Bintulu in the State of Sarawak. The joint venture signed a memorandum of understanding with Sarawak Energy Bhd to supply power for the SALCO smelter. Rio Tinto Alcan was to install the Pechiney (AP) 37 aluminum smelting technology for the SALCO smelter. Aluminum output capacity was to be 720,000 t/yr, and the capacity would eventually be expanded to 1.5 million metric tons per year (Mt/yr). The company would process aluminum into products, such as cables and semimanufactured products, for the domestic and export markets. The total investment of the aluminum project was expected to be $2 billion. The construction of the smelter was scheduled to begin in early 2009, and the smelter was expected to commence operations by the fourth quarter of 2010 and to reach full production in 2011. Raw material (alumina) would be imported from the Yarwun Alumina Refinery in Gladstone, Australia. In early 2012, CMS and Rio Tinto agreed to terminate the development of the aluminum smelter in Sarawak because of an issue of power supply with Sarawak Energy (Sharidan, 2012).

Copper.—Without any refined copper production, Malaysia relied on imported copper to meet its demand. In 2010 (the latest year for which data were available), Malaysia imported 24,426 metric tons (t) of refined copper and copper alloys and 13,151 t of copper scrap and exported 16,569 t of refined copper and copper alloys and 37,336 t of copper scrap. In 2006, Malaco Mining Sdn Bhd explored for copper and gold in the State of Pahang. After 3 years of exploration, Malaco discovered a copper deposit at Sri Jaya, and the Mengapur Mine began production in 2009; however, no production was recorded in 2010 and 2011. Monument Mining Ltd. of Canada through its Malaysian subsidiary Monument Mengapur Sdn Bhd acquired a 70% interest in the Mengapur polymetallic mine. The Mengapur Mine is located 130 km from Monument's wholly owned Selinsing Gold Mine. Monument planned to invest a significant amount of capital to develop the open pit mine and processing facilities based on base- and precious-metals production. Normet Engineering Pty Ltd. completed a mineral resource study of the Mengapur deposit in 1990 and estimated that the deposit contained about 224 Mt of ore with average grades of 6.54% sulfur, 0.25% copper, 8.86 grams per metric ton (g/t) silver, and 0.16 g/t gold (Minerals and Geoscience Department, 2011, p. 18–22; Monument Mining Ltd., 2012).

Gold.—Approximately 16 gold mines were operating Malaysia; all were located in the States of Kelantan, Pahang, and (or) Terengganu. More than 90% of mined gold was from the State of Pahang, mainly the Penjom gold mine at Penjom, the Selinsing gold mine in Sg. Koyan, and Raub Australian Gold Mining Sdn Bhd's gold mine in Raub. The Penjom gold mine was owed by Specific Resources Malaysia Sdn. Bhd. (a wholly owned subsidiary of Avocet Mining plc of the United Kingdom). Specific Resources estimated that the mine's reserves would be depleted by 2018. Avocet Mining decided to concentrate its mining effort in the Africa region and sold its assets in Southeast Asia to J & Partners, L.P. (a private company registered in the Cayman Islands) for $200 million. The transaction was completed in 2011 (Avocet Mining plc, 2011).

Raub Australian Gold Mining (which was a subsidiary of Peninsular Gold Ltd. of the United Kingdom) was continuing with its gold development project at Raub in the State of Pahang. The area around Raub had been the site of extensive gold mining in the past, and the company identified 6.3 t (202,000 troy ounces) of gold in 8.6 Mt of tailings. The company completed the construction of a 0.9-Mt/yr-capacity carbon-in-leach processing plant to recover gold from the tailings in 2011, and the total processing capacity increased to 2 Mt/yr. In 2011, the company recovered 446 kilograms (kg) (14,355 troy ounces), which was about 8% less than that of 2010 owing to a lower recovery rate and lower tonnage throughput. The reduced tonnage throughput was the result of shutdowns of the plant for major maintenance and preparation of a feeding modification of the new circuit. The company started the exploration of the Tersang area, which is located about 20 km north of Raub and could potentially have up to 31.2 t (1 million troy ounces) of gold resources (Peninsular Gold Ltd., 2011, 2012).

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Singapore-listed CNMC Goldmine Holding Ltd. contracted China's Central South University to explore the Sokor area in the State of Kalantan in 2007 and started the construction of a gold mine to begin gold production in 2010. In 2011, the company produced 96 kg (3,097 troy ounces) of gold. The company announced that the Sokor operation area contained 15.6 t (503,000 troy ounces) of gold and identified four gold deposits within 10 square kilometers—Manson's Lode, New Discovery, Rixen, and Sg Ketubong. The four deposits contained a total measured, indicated, and inferred resource of 8.59 Mt at a grade of 1.7 g/t of gold (Asia Miner, 2012).

Iron and Steel.—Malaysian iron ore production was from small-scale mines located in the States of Johor, Pahang, Perak, and Terengganu. The low-grade iron ores were consumed by the pipe-coating industry that supplied cement plants and the oil and gas sector. The high-grade iron ore was exported to China. In 2010, Malaysia exported 2.8 Mt of iron ore to China and imported 2.5 Mt of high-grade iron ore from, in descending order of amount received, Brazil, Chile, and Bahrain. The State Government of Terengganu approved iron ore mining concessions for Eastern Steel Sdn Bhd and Perwaja Holdings Bhd in Bukit Besi. In Terengganu, geologists estimated that more than 50 Mt of iron ore resources was located in the Bukit Besi area and that the iron content was about 70%. Perwaja planned to invest about $130 million to build a pelletizing plant in Kemaman, where its direct-reduced iron plant was located. Perwaja intended to mine 2 Mt/yr iron ore and to produce 1.2 Mt/yr of pellets during its first year operation; it planned to increase the pellet production to 2.4 Mt/yr in 2013. The company estimated that production costs were about $50 per metric ton of pellet, which was lower than the $90 to $120 per metric ton cost of imported pellet (Southeast Asia Iron and Steel Institute, 2012b).

Malaysian steel producers planned to invest about $1.5 billion to expand iron production to 3.2 Mt. The Malaysian Iron and Steel Federation (MISF) estimated that the country's steel consumption was about 8.2 Mt in 2011, which was same level as in 2010; however, crude steel production was about 5.9 Mt in 2011. The Malaysian Government awarded a contract to Boston Consulting Group (BCG) to undertake an indepth study of the country's steel sector. BCG recommended that the Malaysian Government provide an effective mechanism for the local producers to be competitive on the global market. In Malaysia, raw materials accounted for about 65% to 70% of the production costs, and the country was not self-sufficient in raw material supplies for its iron and steel sector. The volatility in the prices of raw materials posed a great challenge to local downstream steel producers to compete in the global market. Since the implementation of the Association of Southeast Asian Nations-China Free Trade Agreement in 2010, a significant amount of steel products imports from China competed for market share with similar steel products produced locally. BCG recommended that the Malaysian steel producers upgrade their production technology and improve their operational efficiency (Southeast Asia Iron and Steel Institute, 2012a).

Eastern Steel Sdn Bhd [a joint venture among Hiap Tech Ventures Bhd, 55%; China Shougang International Trade and Engineering Corp. (a subsidiary China Shougang Group), 40%; and Chinaco Investment Pte Ltd., 5%] planned to invest $600 million to build an integrated steel complex in the Kemaman Heavy Industry Park, Trengganu. The phase one construction of a 300,000-t/yr coking plant and a 600-cubic-meter blast furnace to produce 700,000 t/yr of pig iron and 700,000-t/yr of crude steel started in 2011. The total cost of phase one of the project was projected to be $250 million, and the project was scheduled to be completed in mid-2013. After the completion of phase two construction, Eastern Steel would have the capability to produce between 3 and 3.5 Mt/yr of steel products. The company planned to use domestic and imported iron ore as a feed for its blast furnace (Southeast Asia Iron and Steel Institute, 2011).

Magnesium.—CVM Minerals Ltd. (a subsidiary of Ho Wah Genting Bhd, which was incorporated in Hong Kong) started the construction of a magnesium smelter at the Kamunting Raya Industrial Park in the State of Perak. The 30,000-t/yr Pidgeon process smelter was designed by Beijing Tieforce Engineering Co. Ltd. The construction of the smelter was divided into two phases. The first-phase construction of a 15,000-t/yr production line had been completed in June 2010. The raw material (dolomite) was sourced from CVM's Dolomite Hills, which is located about 60 km from the smelter and which had ore resources of 20 Mt. Owing to equipment and technical problems, the smelter was unable to achieve its production level. The smelter was shut down during the second half of 2011 and had undergone further technical testings to ensure that the smelter was operating efficiently to reduce operation costs. The company expected that the smelter would reach full capacity in 2013. The company did not release magnesium ingot output data for 2011 (CVM Minerals Ltd., 2012, p. 37).

Manganese.—Malaysia's manganese resources were located in Johor, Kelantan, Pahang, and Terengganu, and the manganese content was usually less than 50%. The volume of manganese output from Malaysia depended on prices of manganese in the world markets. Since 2005, with an increase in manganese prices in the world, Malaysia's manganese output gradually increased during the past several years. Without much domestic demand for manganese, the country exported nearly all its output to China. Pertama Ferroalloys Sdn Bhd [formerly known as ANL Manganese (Malaysia) Sdn Bhd] [a joint venture between Asia Mineral Ltd. (ANL), 51%, and customers from Japan Steel Group, Korea Steel Group, and a local Malaysian company, 49%] planned to build a manganese ferroalloy plant in the Samalaju Industry Park in Bintulu in the State of Sarawak. The ferroalloy plant was designed to produce 350,000 t/yr of manganese ferroalloy by the fourth quarter of 2014. ANL signed an agreement with Sarawak Energy for the provision of 270 MW of electricity generation capacity for 20 years. Raw materials would be sourced from Brazil, South Africa, and local mines. OM Minerals (Sarawak) Sdn Bhd (a joint venture between OM Holdings Ltd., 80%, and Cahya Meta Sarawah Bhd, 20%) planned to build a 600,000-t/yr ferroalloy plant in the Samalaju Industrial Park in Sarawah. The Board of OM Holdings approved a definitive feasibility study in 2011; construction would start in 2012, and the plant was scheduled to be put into operation in the first quarter of 2014 (Minerals and Geoscience Department, 2011, p. 36; Australia's Paydirt, 2012).

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Tin.—Malaysia's tin mine production produced about 3,000 t during the past several years. Resources were depleted and ore grades were lower after more than 100 years of active mining operations. The country imported tin concentrates from other countries in Asia and Africa to meet its demand. Solder production was the leading tin consuming sector in Malaysia, followed by tinplate and pewter. Tin consumption in Malaysia decreased to less than 3,000 t/yr during the past 3 years. The decrease in tin consumption was mainly the result of a decrease in demand from the solder and the pewter sectors; consumption by other consumers remained at the same level during that period. Malaysia Smelting Corp. Bhd. (MSC) was Malaysia's sole integrated tin producer; it produced 40,267 t of refined tin at its Butterworth smelter in 2011, which was about 4.0% more than it produced in 2010. The increase in tin production was a result of MSC's ability to source raw material from overseas markets. In 2011, Malaysia imported 30,027 t of tin concentrates compared with 30,589 t in 2010. Malaysia's refined tin exports increased to 42,302 t in 2011 from 33,697 t in 2010 and went mainly to Japan, the Republic of Korea, Singapore, and Taiwan. The MSC's tin mining company, Rahman Hydraulic Tin Sdn Bhd (RHT), agreed to increase the royalty paid on sales of tin in concentrates to the State of Perak to 5% from 2.5% upon the renewal of its mining leases in March 2012; the new leases would be valid through September 28, 2030. In 2011, RHT produced 2,010 t of tin in concentrates, which was 13.6% more than in 2010, and discovered more tin resources in the Perak area that could prolong the mine life beyond 15 years (Malaysian Tin Bulletin, 2012; Malaysia Smelting Corp. Bhd., 2012, p. 25–26).

Industrial Minerals

Cement.—Malaysia's cement sector was dominated by three companies: Cement Industries of Malaysia Bhd, Lafarge Malaysia Cement Bhd, and YTL Cement Bhd; together, these companies accounted for about 78% of the country's total cement output capacity. Cement demand in Malaysia had fluctuated between 16 and 17 Mt/yr during the past 5 years. West Malaysia had one of the most developed infrastructures in the country, but east Malaysia remained relatively undeveloped. Under the 10th Malaysia Plan and Economic Transformation program, the Government planned to build the east coast highway from Jabur to Kuala Terrenggaru and to improve rural infrastructure. Together with ongoing construction of commercial properties, the demand for cement was expected to increase during the next several years (International Cement Review, 2012).

Rare Earths.—Globally, the production and resources of rare earths were dominated by China. Lynas Corp. Ltd. of Australia planned to develop the rare-earth deposit at Mount Weld in Western Australia and to ship rare-earth concentrates to Malaysia for further processing. Lynas secured approval from the Malaysian Government to build an advanced materials plant in the Gebeng III Industrial Area, which is located near the Port of Kuantan in the State of Pahang. The construction of the plant was scheduled to be completed in late 2011 and to be put into operation in 2012. The plant would have an initial output capacity of 11,000 t/yr of rare-earth-oxide-equivalent products. Local residents objected to the construction of the rare-earth plant in their area because they worried about the safety of storing low-level radioactive waste that could cause lasting environmental damage. They feared that Lynas's plant would be a repeat of the Mitsubishi Chemical rare-earth plant in the area, which was shut down in 1992. The Government invited experts from the International Atomic Energy Agency (IAEA) to review the rare-earth project. The IAEA issued 11 recommendations, including the recommendation to install an airborne monitoring system at the site and in Kuantan Town and to have a permanent disposal facility with specifications required by the Atomic Energy Licensing Board and Department of Environment within 5 years. The Malaysian Government allowed Lynas to store the waste onsite temporarily until a permanent disposal facility is identified and required the company to have $50 million deposited with the Government. The government of the State of Western Australia in Australia announced that Australia would not accept the waste generated by the Lynas rare-earth plant in Malaysia. The Malaysian Parliamentary Committee approved a temporary operating license to Lynas. A local environmental group applied to the High Court of Malaysia for an injunction to block Lynas's license. As of the end of 2011, Lynas was awaiting for the court decision on whether or not to allow its rare-earth separation plant to be operated (Star, The, 2012).

Mineral Fuels

Coal.—Malaysia's coal resources are located in the States of Perak, Perlis, Sabah, Sarawak, and Selangor. Coal was produced from the areas of Bintulu, Merit-Pila, Silantek, and Tutoh in the State of Sarawak. The country has coal resources of about 1.9 billion metric tons (Gt), of which 281 Mt was measured, 378 Mt was indicated, and 1.3 Gt was inferred. About 1.5 Gt of the country's coal resource is located in Sarawak, and more than 300 Mt is located in Sabah. Owing to the lack of infrastructure, most of the coal in the interior areas of the country had not been exploited. Coal resources located in Sabah were in the Maliau Basin Conservation area, which the Government had designated as a protected area. Mining and exploration for coal were conducted only in Sarawak. Power-generating plants consumed about 70% of the total supply of coal (domestic production and imports), and the remaining supply was consumed by the cement and iron and steel sectors. Despite Malaysia's position as a natural gas exporter, Tenaga Nasional Berhad planned to decrease the use of natural gas at its powerplants to 49% from 72% and to shift to the use of coal because of a shortage in the supply of natural gas in the domestic market. Coal demand for powerplants would likely increase; as a result, coal consumption was expected to increase to 21 Mt in 2011. The supply of domestic coal would likely not be sufficient to meet the demand, and the country was expected to increase coal imports to fill the gap. In 2010 (the latest year for which data were available), Malaysia imported 19.9 Mt of coal, which was about 10.4 Mt more than in 2009. Coal imports from Indonesia accounted for 71.4% of the total imports followed by Australia, 13.5%; South Africa, 12.2%; and others, 2.9% in 2010. Coal consumption was expected to increase to 36 Mt in 2020

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because the demand for electricity was expected to increase; in expectation of this increase in demand, the Government planned to build another coal-fired powerplant (Minerals and Geoscience Department, 2011, p. 104–105).

Natural Gas and Petroleum.—Malaysia remained a net exporter of natural gas and crude oil. The increase in natural gas production was caused by the growth of external demand for LNG from China and Japan. On January 1, 2012, Petronas reported that the country had oil and natural gas reserves totaling 21.3 billion barrels of oil equivalent, which was 2.2% more than on January 1, 2011. The Malaysian Government offered incentives for companies to explore deeper and less-profitable fields in a bid to increase reserves as energy demand increases (Petroliam Nasional Berhad, 2012, p. 44).

Outlook

With the global economy recovering only slowly, Malaysia's economy is projected to grow at a slower rate during the next 3 years than in the previous several years. Private and public spending, however, will likely continue to support economic growth. The Government is aware of the country's need to reduce its dependence on external markets and to produce a more-diversified range of goods for export. To improve the investment climate and build a more-competitive economy, the Government plans to privatize state-owned companies, sell Government land, and reassess Government subsidies. The Government plans to further relax some rules regarding foreign investment in Malaysian companies and properties, initial public offerings, and the financial sector. The construction sector is expected to expand as a result of increased investment by the Government in infrastructure under the Tenth Malaysia Plan, and the demand for construction steel products will also likely increase. Several natural gas and oil projects are set to come onstream to replace maturing fields during the next several years.

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TABLE 1
MALAYSIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2007	2008	2009	2010	2011
METALS						
Aluminum, bauxite, gross weight		156,785	295,176	263,432	124,274	188,141
Copper, mine, Cu content		--	--	240	-- r	--
Gold, mine output, Au content[3]	kilograms	2,913	2,489	2,794	3,765 r	4,215
Iron and steel:						
Iron ore, gross weight		802,030	981,932	1,470,186	3,465,895	7,698,577
Pig iron, direct-reduced iron, and hot-briquetted iron	thousand metric tons	1,872	1,957	2,388	2,390	2,876
Steel, crude	do.	6,895	6,423	5,354	5,693	5,941
Lead metal, secondary[e]		73,000	73,000	72,000	72,000	72,000
Manganese, gross weight		56,500	536,675	468,963	899,703	576,835
Niobium (columbium)-tantalum metals, struverite, gross weight		52	216	176	84	110
Rare-earth metals, monazite and xeonotime, gross weight		682	233	25	732	779
Silver, mine output, Ag content[3]	kilograms	295	349	367	436	459
Tin:						
Mine output, Sn content		2,263	2,605	2,412	2,668	3,346
Metal, smelter		25,471	31,691	36,407	38,737	40,267
Titanium:						
Ilmenite concentrate, gross weight		59,310	36,779	15,983	19,036 r	28,782
Rutile		1,450	1,834	1,502	7,567	10,810
Dioxide[e]		56,000	56,000	56,000	56,000	56,000
Zirconium, zircon concentrate, gross weight		7,393	984	1,145	1,267 r	1,685
INDUSTRIAL MINERALS						
Barite		--	4,372	22,390	1,000	--
Cement, hydraulic	thousand metric tons	21,909	19,629	19,457	19,762	20,000 e
Clays and earth materials	do.	28,291	25,065	22,966	27,543 r	27,000 e
Feldspar		358,775	457,377	410,053	455,497 r	379,628
Kaolin		587,508	506,462	487,632	530,331	442,500
Mica		6,118	5,593	4,323	4,515	4,244
Nitrogen, N content of ammonia		950,000	950,000	950,000	950,000	950,000
Sand and gravel	thousand metric tons	22,370	24,472	17,382	30,678 r	30,000 e
Silica sand		719,221	1,466,904	630,394	932,159	900,000 e
Stone:						
Aggregate	thousand metric tons	79,118	75,883	86,497	101,809 r	100,000 e
Dolomite		49,320	57,900	49,000	50,900 r	50,000 e
Limestone	thousand metric tons	33,688	35,228	35,808	32,398 r	32,000 e
MINERAL FUELS AND RELATED MATERIALS						
Coal		1,074,936	1,166,525	2,138,390	2,397,340	2,915,788
Gas, natural:						
Gross	million cubic meters	71,170	68,000	65,000	72,000 r	73,000
Net[4]	do.	60,804	61,004	58,560	61,136 r	61,400
Liquefied natural gas	thousand metric tons	22,900	23,422	22,452	24,363	25,000 e
Petroleum:						
Crude and condensate	thousand 42-gallon barrels	249,295	251,811	240,479	232,100	221,000 e
Refinery products[e, 5]	do.	220,000	210,000	200,000	210,000	215,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through October 5, 2012.

[2]In addition to the commodities listed, a variety of crude construction materials, which include clays and stone, fertilizers, magnesium, and salt, is produced but not reported, and information is inadequate to make reliable estimates of output.

[3]Includes byproduct from tin mines in Peninsular Malaysia and gold mines in Peninsular Malaysia and the State of Sarawak.

[4]Includes production from Peninsular Malaysia and the States of Sabah and Sarawak.

[5]Gross less volume of reinjected and flared.

Sources: Ministry of Primary Industry, Minerals and Geoscience Department (Kuala Lumpur), Malaysian Minerals Yearbook 2010; U.S. Geological Survey Minerals Questionnaire, 2012; and Southeast Asia Iron and Steel Institute, Steel Statistical Yearbook, 2011.

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TABLE 2
MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum, metal		Press Metal Sarawak Sdn Bhd (Press Metal Berhad)	Mukah, Sarawak	120.
Bauxite		Johore Mining and Stevedoring Co. Sdn. Bhd.	Teluk Rumania and Sg. Rengit, Johor	400.
Cement[1]		Cement Industries of Malaysia Bhd. (United Engineers Malaysia Bhd., 53.97%, and others, 46.03%)	Kangar, Perlis	2,000 cement; 1,650 clinker.
Do.		do.	Bahau, Negeri Sembilan	1,580 cement; 1,300 clinker.
Do.		CMS Cement Sdn Bhd (subsidiary of Cahya Mata Sarawak Bhd)	Bintulu and Kuching, Sarawak	1,750 cement; 800 clinker.
Do.		Holcim (Malaysia) Sdn Bhd (Holcim Ltd.)	Pasir Gudang, Johor	1,300 cement.
Do.		Lafarge Malayan Cement Bhd. (subsidiary of Lafarge S.A.)	Rawang, Selangor	6,810 cement; 4,900 clinker.
Do.		do.	Kanthan, Perak, Langkawi, Kedah	5,370 cement; 3,300 clinker.
Do.		do.	Pasir Gudang, Johor	770 cement.
Do.		YTL Cement Berhad (subsidiary of YTL Group)	Bukit Sagu, Pahang	1,300 cement; 1,200 clinker.
Do.		do.	Padang Rengas, Perak;	3,400 cement; 3,000 clinker.
Do.		do.	Pasir Gudang and Wesport, Johor	1,000 cement.
Do.		Tasek Corp. Bhd (publicly owned company)	Ipoh, Perak	2,300 cement; 2,300 clinker.
Copper, mine		Malaco Mining Sdn Bhd	Sri Jaya, Pahang	4.
Gas:				
Natural	million cubic meters per day	ExxonMobil Exploration and Production Malaysia, Inc.	Offshore Terengganu	45.
Do.	do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	3.
Do.	do.	Sarawak Shell Bhd.	Offshore Sarawak	80.
Liquefied		Malaysia LNG Sdn. Bhd. (Petroliam Nasional Berhad, 65%; Shell Gas N.V., 15%; Mitsubishi Corp., 15%; Sarawak State government, 5%)	Tanjung Kidurong, Bintulu, Sarawak	8,100.
Do.		Malaysia LNG Dua Sdn. Bhd. (Petroliam Nasional Berhad, 60%; Shell Gas N.V., 15%; Mitsubishi Corp., 15%; Sarawak State government, 10%)	do.	7,800.
Do.		Malaysia LNG Tiga Sdn. Bhd. (Petroliam Nasional Berhad, 60%; Shell Gas N.V., 15%; Nippon Oil LNG (Netherlands) BV, 10%; Sarawak State government, 10%; Diamond Gas Netherlands BV, 5%)	do.	6,800.
Gold, refined	kilograms	J Resources (J&Partners, L.P., 100%)	Penjom, Pahang	4,000.
Do.	do.	Raub Australian Gold Mining Sdn. Bhd (Peninsular Gold Ltd., 100%)	Raub, Pahang	500
Do.	do.	Monument Mining Ltd. of Canada	Bukit Selinsing Koyan, Pahang	1,500.
Iron and steel:				
Direct-reduced iron		Lion DRI Sdn Bhd (Lion Group)	Banting, Selangor	1,540.
Do.		Perwaja Steel Sdn. Bhd. (Kinsteel Bhd, 51%, and Maju Holdings Sdn. Bhd., 49%)	Kemaman, Terengganu	1,800.
Hot-briquetted iron		Amsteel Mills Sdn Bhd (Lion Group)	Labuan Island, offshore Sabah	880.
Crude steel		do.	Banting, Selangor	1,250.
Do.		do.	Klang, Selangor	750.
Do.		Ann Joo Steel Bhd (Ann Joo Group)	Prai, Penang	900.
Do.		Antara Steel Sdn. Bhd. (Lion Grop)	Pasir Gudang, Johr	600.
Do.		Kinsteel Sdn Bhd	Kuantan, Pahang	500.
Do.		Megasteel Sdn Bhd (Lion Group)	Banting, Selangor	700.
Do.		Malaysia Steel Works Bhd	Bukit Raja, Selangor	450.
Do.		Perwaja Steel Sdn. Bhd. (Kinsteel Bhd, 51%, and Maju Holdings Sdn. Bhd., 49%)	Kermaman, Terengganu	1,500.
Do.		Southern Steel Bhd. [Camerlin (a member of Hong Leong Group Malaysia), 40.75%; Natsteel Ltd., 27.03; others, 32.22%]	Prai, Penang	1,300.

See footnotes at end of table.

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TABLE 2—Continued
MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Magnesium, metal		CVM Minerals Ltd.	Kamunting Raya, Perak	15,000.
Nitrogen, ammonia		Asean Bintulu Fertilizer Sdn. Bhd. (Petroliam Nasional Berhad, 63.5%; P.T. Pupuk Sriwidjaja Indonesia, 13%; Thai Ministry of Finance, 13%; Philippines National Development Co., 9.5%; Singapore Temasek Holdings Pte. Ltd., 1%)	Bintulu, Sarawak	395.
Do.		Petronas Fertilizer Kedah Sdn. Bhd. (wholly owned subsidiary of Petroliam Nasional Berhad)	Gurun, Kedah	378.
Do.		Petronas Ammonia Sdn. Bhd. (wholly owned subsidiary of Petroliam Nasional Berhad)	Kerth, Terengganu	370.
Petroleum, crude	thousand 42-gallon barrels per day	ExxonMobil Exploration and Production Malaysia, Inc.	Offshore Terengganu	390.
Do.	do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	100.
Do.	do.	Sarawak Shell Bhd.	Offshore Sarawak	184.
Do.	do.	do.	do.	184.
Do.	do.	Petronas Carigali Sdn. Bhd.	Offshore Terengganu	22.
Do.	do.	Murphy Sarawak Oil Co. Ltd.	Offshore Sarawak	15.
Tin:				
Concentrate		Delima Industries Sdn. Bhd.	Dengkil, Selangor	1.1.
Do.		Maiju Sama Sdn. Bhd.	Puchong, Selangor	1.6.
Do.		New Lahat Mines Sdn. Bhd.	Lahat, Perak	0.3.
Do.		Omsam Telecommunication Sdn. Bhd.	Bakap and Batu Gajah, Perak	0.5.
Do.		Rahman Hydraulic Tin Bhd.	Klian Intan, Perak	1.2.
Do.		S.E.K. (M) Sdn. Bhd.	Kampar, Perak	0.4.
Do.		Tasek Abadi Sdn Bhd.	Senudong and Kampar, Perak	0.5.
Refined		Malaysia Smelting Corp. Bhd. (The Straits Trading Co. Ltd., 37.44%; Malaysia Mining Corp., 37.44%; others, 25.12%)	Butterworth, Penang	35.
Titanium dioxide		Huntsman Trioxide Sdn. Bhd. (a subsidiary of Huntsman Tioxide)	Kemaman, Terengganu	56.

Do., do. Ditto.
[1]All companies operated integrated plants.

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The Mineral Industry of Mongolia

By Susan Wacaster

In 2011, Mongolia was estimated to be the world's third ranked producer of fluorspar after China and Mexico, producing both acid and metallurgical grades. Mongolia is a landlocked country situated between Russia to the north and China to the south. The country's mineral deposits remained of relatively limited global interest until about the past decade when global economic growth trends shifted towards Asia (Miller, 2012).

Mongolia has large proven reserves of coal, copper, fluorspar, and gold. As major mining companies began to take notice of such world class deposits as the Oyu Tolgoi porphyry deposit and the Tavan Tolgoi coking coal deposit and as China's demand for minerals increased, Mongolia expanded its domestic exploration and development projects through joint ventures with both junior and major international mining companies (Gotovsuren and others, 2012).

Mineralized systems with copper, gold, molybdenum, tin, and tungsten are common in Mongolia. As of 2008, it was estimated that about 30% of all the near-surface territory of Mongolia hosted granitoids, most of which have greisens and vein mineralization associated with calc-alkaline magmas. The central region of Mongolia is characterized by complex folded structures and basins where mineralized zones are frequently encountered. The South Gobi desert has extensive coal deposits, and petroleum is produced in the eastern part of the country. The entire country has been mapped geologically at a scale of 1:200,000, and about 25% has been mapped at a scale of 1:50,000 and explored for mineral occurrences (Gotovsuren and others, 2012).

Currently, Mongolia has one of the fastest growing economies in Asia, mainly as a result of significant foreign investment in its mining industry. By 2020, the value derived from Oyu Tolgoi alone was expected to account for one-third of Mongolia's gross domestic product (GDP). The country, however, was experiencing inflationary pressure because of the rapid economic growth that was taking place on a relatively short time scale; that is, since the economic reforms were begun in 1991 to transform the country into a market economy from a communist state. Mongolia was facing significant development challenges as the social and economic benefits associated with the mining boom were not being distributed evenly among the population. Access to water and sanitation and the quality of education remained problematic. Poverty was high at about 35% of the population, and extreme weather events and mining were placing increasing stress on Mongolia's fragile natural environment (Commonwealth of Australia, 2011, p. 93–94).

Minerals in the National Economy

According to the National Statistical Office of Mongolia, preliminary estimates of the 2011 GDP (at current prices) indicated a year-on-year increase of 27.8% compared with that of 2010. In real terms, that growth was attributed to a 42.5% increase in the output value of wholesale and retail trade, a 16.0% increase in the output value of the manufacturing sector, a 14.3% increase in the output value of the construction sector, and an 8.7% increase in the output value of mining and quarrying compared with those of 2010 (National Statistical Office of Mongolia, 2011, p. 12–13).

Mongolia's mining sector accounted for as much as 80% of the country's exports and generated nearly 50% of Government revenue. Transportation, power, and water, as well as other infrastructure development, however, would be needed to increase the production and commercialization of the country's minerals as well as generate jobs and related industry services. In May 2011, the World Bank approved an investment credit of $25 million for the Mining Infrastructure Investment Support Project (MINIS). The MINIS would reportedly direct resources towards such projects as infrastructure feasibility studies and water resources management and it was to be implemented between June 2011 and May 2016 (World Bank, The, 2011, p. 7).

Government spending increased by 56% in 2011 mainly because of pre-election year capital expenditures and cash handouts to citizens, and was planned to increase to 32% in 2012, driven by sharply rising resource revenues. Growth in wholesale and retail trade reflected increased consumption fueled by increased Government spending (World Bank, The, 2012).

Mongolia's trade deficit increased significantly in 2011 to $1.7 billion compared with $370 million in 2010. The current account deficit increased to 35% of the GDP in 2011 compared with 14% in 2010, but was covered by record levels of foreign direct investment (FDI) inflows, which increased to $5.3 billion in 2011 from $1.1 billion in 2010. The amount of FDI directed to the mining sector in 2011 was unavailable (World Bank, The, 2012, p. 17).

In 2011, the total value of Mongolia's gross industrial output at current prices was $4.01 billion compared with $3.26 billion in 2010. Of that amount, mining and quarrying accounted for about 70% in both years. The value derived by the mining of coal and peat was about $995 million in 2011, which was an increase of about 46% compared with that of 2010. Crude petroleum output contributed about $255 million to the total compared with about $176 million in 2010, which was an increase of about 45%. The value derived from the mining of metal ores was about $1.5 billion in 2011 compared with $1.3 billion in 2010, and the value of other mining and quarrying production was $47.3 million compared with $55.4 million in 2010 (National Statistical Office of Mongolia, 2011, p. 110).

Government Policies and Programs

Mineral resources in Mongolia are the property of the state. The Minerals Law of Mongolia regulates the prospecting and exploration for and the mining of minerals within the country's territory. Numerous laws, guidelines, and procedures govern the prospecting, exploration, and mining of minerals, and include

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the Constitution of Mongolia, the Environmental Protection Law, the Land Law, the National Security Law, the Subsoil Law, and the Water and Forest Law, among others (Mineral Resources Authority of Mongolia, 2011).

In 2011, Mongolia implemented the Fiscal Stability Law, which establishes fiscal policies designed to shield the economy from mining sector-related booms and busts. In December 2011, the country also passed the Integrated Budget Law, which defines the country's entire budget process and contains measures to support fiscal sustainability, and, in particular, the successful implementation of the Fiscal Stability Law (World Bank, The, 2012, p. 25).

Production

In 2011, coal production increased to about 30.9 million metric tons (Mt), or by 23% compared with that of 2010. The gross weight of iron ore production increased by 77% in 2011 compared with that of 2010, and the iron content contained in iron ore increased by about 76% to 3.6 Mt. Production of acid-grade fluorspar decreased by 17% (table 1; National Statistical Office of Mongolia, 2011, p. 112–113).

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities. Most of the producing mining companies in Mongolia have mixed ownership between private international companies and the Mongolian Government or are primarily state owned, but there are also some that are wholly owned by foreign investors. In 2011, there were 383 active and 130 inactive mining and (or) quarrying establishments registered by the county's 2011 establishment census. Forty-one of the inactive establishments were reported not to have started activities, 74 had temporarily stopped activities, and 3 had permanently stopped activities; the status of the remaining 12 inactive establishments was reported as unknown. Of the 383 active establishments, about 52% was reported to have 1 to 9 employees, 18% had 10 to 19 employees, 16% had 20 to 49 employees, and about 14% had 50 or more employees (National Statistical Office of Mongolia, 2011, p. 88).

Mineral Trade

In 2011, the value of exports from Mongolia increased by 64% to $4.8 billion, and that of imports to Mongolia increased by 103% to about $6.5 billion (the imports were mostly mining transport equipment, fuel, and machinery). China was the leading recipient of Mongolian exports in terms of value, and it accounted for about $4.4 billion (compared with $2.5 billion in 2010), or 92% of the total. It was followed by Russia and Canada, which accounted for $96 million and $91 million, respectively or, combined, about 4% of the total. The value of exported (unspecified) mineral products increased by 79% to $4.3 billion compared with $2.4 billion in 2010 (National Statistical Office of Mongolia, 2011, p. 76–84).

The volume of Mongolian copper exports changed little in 2011, but their value increased by greater than 50% to $964 million as 573,000 t of copper concentrate was exported compared with 569,000 t valued at $771 million in 2010. In 2011, 2,400 t of refined copper and copper alloys valued at $21 million was exported from Mongolia compared with 2,800 t valued at $20.4 million in 2010. Also, 404,000 t of fluorspar valued at $94.9 million was exported from Mongolia compared with 406,000 t valued at $68.8 million in 2010 (National Statistical Office of Mongolia, 2011, p. 76–84).

Commodity Review

Metals

Copper and Gold.—In 2011, Centerra Gold Ltd. of Canada produced about 1,842 kilograms (kg) (reported as 59,224 troy ounces) of gold at Boroo. Boroo began commercial production in March 2004 primarily from disseminated sulfide veins. By November 2010, mining had ceased at Boroo, but the operation continued to mill stockpiled ore (Centerra Gold, Inc., 2012, p. 4).

The Oyu Tolgoi copper and gold project is located in the Southern Gobi region and was being developed by Oyu Tolgoi LLC (OT LLC), which was formerly called Ivanhoe Mines Mongolia Inc. The project consists of a series of porphyry deposits containing copper, gold, silver, and molybdenum, which stretch for 26 kilometers (km) from the Hugo North deposit in the north through the adjacent Hugo South deposit, down to the Southern Oyu deposit, and further to the Heruga deposit in the south. The first phase of construction was advancing in 2011, and by early 2012, it included a concentrator, the open pit of Southern Oyu, and supporting infrastructure. Phase 2 would include production from Hugo North, expansion of the concentrator and infrastructure, and construction of a power station (Ivanhoe Mines Ltd., 2012, p. 1).

In 2009, the Mongolian Parliament authorized the Government of Mongolia to conclude the Oyu Tolgoi investment agreement (IA) with Ivanhoe Mines Ltd. of Canada and Rio Tinto plc of the United Kingdom. The companies had been negotiating the terms with the Government since 2005. During the intervening years, the companies had advanced the planning for the project's development, including capital estimations, procurement, the underground shaft, and other construction activities, and increased the project's mineral resource base (Ivanhoe Mines Ltd., 2012, p. 2).

Under that agreement the Government would become a partner in the development of the project and acquire a 34% interest in the Ivanhoe Mines subsidiary OT LLC, which held the Oyu Tolgoi mining licenses. The country's interest was to be held through the state-owned sovereign wealth resources company Erdenes MGL LLC, and Ivanhoe Mines would own a 66% indirect interest in OT LLC (Ivanhoe Mines Ltd., 2012, p. 2).

Ivanhoe Mines and the Government agreed that because of the extent of the mineral discoveries and the potential for additional discoveries, the approved IA should conform with the provision of Mongolia's Minerals Law, which specifies that certain deposits of strategic importance qualify for 30 years of stabilized tax rates and regulatory provisions, with an option of extending the term of the IA for an additional 20 years. Major taxes and rates stabilized for the life of the agreement were to include the corporate income tax, customs duty, excise tax, exploration and mining licenses, and immovable property and (or) real estate tax, royalties, and value-added tax. As of

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December 2010, a revised agreement was signed by Rio Tinto and Ivanhoe Mines, which established that Rio Tinto would manage the core operations and that Ivanhoe Mines would manage the exploration activities in certain areas (Ivanhoe Mines Ltd., 2012, p. 2, 4).

In June 2011, the Government passed Resolution 175 to authorize the designation of certain land areas for special state needs within certain defined areas near Oyu Tolgoi. Those areas were to be used for infrastructure facilities necessary to implement the development and construction of major mineral projects, including OT LLC. Most of that designated land was already subject to existing mineral exploration and mining licenses issued to third parties, and in some cases, a mineral resource had already been declared and registered. OT LLC entered into certain arrangements with some of the affected third parties; however, those arrangements had not been completed by March 2012 (Ivanhoe Mines Ltd., 2012, p. 10).

If OT LLC was not successful in reaching a consensual arrangement with an affected third party and the third party's rights to use and access the land is adversely affected by application of Resolution 175, the Government was to be responsible for compensating the third party in accordance with the mandate of the Resolution. As of March 2012, it was unclear whether the Government would expect some of the compensation to be borne by OT LLC (Ivanhoe Mines Ltd., 2012, p. 11).

Measured and indicated mineral resources at Oyu Tolgoi included almost 19 Mt (reported as 41 billion pounds) of contained copper and more than 650,000 kg (reported as 21 million troy ounces) of contained gold and another 19 Mt (reported as 41 billion pounds) of contained copper and almost 780,000 kg (reported as 25 million troy ounces) of contained gold in the inferred category. The operation was expected to start up in 2013 (Ivanhoe Mines Ltd., 2012, p. 13).

Mineral Fuels

Coal.—The coal industry in Mongolia dates back to 1922, and coal accounts for 90% of the fuel used for electric power and heat generation in the country. There are about 300 coal deposits and occurrences in 15 basins, about 60% of which are located in the Eastern and Gobi regions. Mongolia's total coal resources include 9.8 billion tons of proven reserves and 162.3 billion tons of inferred resources (Coal Mongolia, 2012, p. 21–23).

Mongolia's still unexploited Tavan Tolgoi coal deposit contains a reported 6.5 billion metric tons (Gt) of coking coal. In the spring of 2011, reports were released stating that the initial public offering (IPO) for Tavan Tolgoi would take place by the end of 2011 or in early 2012. In 2011, the state-owned Erdenes Tavan Tolgoi Co. reportedly planned to retain ownership of 50% of the project and would distribute 10% of the shares to Mongolian citizens, 10% to Mongolian companies, and 30% to the IPO (Chinese Stock Information, 2010).

The $3 billion IPO was reportedly delayed because of the lack of a legal framework that Hong Kong requires for listing on its stock exchange. Hong Kong recognized more than 20 jurisdictions in which companies could be incorporated, but Mongolia was not among them. The delay increased the amount of money to $600 million from $400 million that Erdenes would have to raise in the months before the offering for funding the initial infrastructure developments, including the coal handling and processing plants, transport facilities, and water supply (Chiu, 2012).

Outlook

Mongolia's GDP, real economic growth, and growth of the mineral and nonmineral sectors have been rising steadily for the past several years, as have both the export and the import volumes and values. Inflation has been on the rise, too, but has remained far below the 34% rate that was reached in 2008 when economic growth and price increases prior to the global economic downturn seriously affected the country's economy. Growth in the GDP is expected to continue to increase significantly to at least 2016. The value derived from mining and mineral exploration will also likely continue to increase. The inflation rate is projected to level out at about 10% by the end of 2014, and foreign trade is expected to continue to increase until at least 2016 (Coal Mongolia, 2012, p. 35–43).

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TABLE 1

MONGOLIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2007	2008	2009	2010	2011
Cement, hydraulic	thousand metric tons	180	270	235	323	426
Coal, unspecified	do.	9,560	9,692	13,164	25,246	30,940
Copper:						
Mine output, Cu content		130,160	126,796	129,800	124,985	121,590
Metal, refined		3,007	2,587	2,470	2,746	2,390
Fluorspar:						
Acid grade	thousand metric tons	131	116	115	141	116
Submetallurgical and other grade	do.	250	219	344	259	232
Total	do.	381	335	459	400	461
Gold, mine output, Au content[3]	kilograms	17,473	15,184	9,803	6,037	5,703
Iron ore:						
Gross weight	thousand metric tons	265	1,387	1,380	3,203	5,678
Iron content	do.	170	888	883	2,050	3,600
Lime, hydrated and quicklime	do.	43	55	43	50	45
Molybdenum, mine output, Mo content		1,978	1,780	2,140	2,198	1,960
Petroleum, crude	thousand 42-gallon barrels	913	1,174	1,870	2,181	2,549
Salt, mine output		1,143	1,176	1,402	1,861	2,183
Silver, mine output, Ag content[4]	kilograms	28,100 e	28,890	29,321	28,710	28,254
Steel, crude		80,400	81,400	50,100	64,200	60,000
Stone, crushed	thousand metric tons	144	103	123	101	94
Tungsten, mine output, W content		245	142	39	20	20
Zinc, mine output, Zn content		77,350	143,600	141,500	112,600	104,700

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. do. Ditto.

[1]Table includes data available through July 11, 2012.

[2]In addition to the commodities listed, crude construction materials, such as gypsum, sand and gravel, and varieties of stones, such as limestone and silica, are produced, but available information is inadequate to make reliable estimates of output.

[3]Reported raw gold production but excludes gold contained in copper concentrate.

[4]Based on 55 grams per metric ton of silver in copper concentrate.

Sources: Mineral Resources Authority of Mongolia (2007–2009); National Statistical Office of Mongolia (2007–2011).

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TABLE 2
MONGOLIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity[e]
Calcium oxide	Qinhua MAK Naryn Sukhait LLC (Mongolia-China joint venture)	316 km from Ulaanbaatar at the Olon Ovoot station of the Trans Mongolia railway	50
Cement	Khutul Cement and Lime Factory	Darhan, Darhan-Uul Aymag	500
Coal	Baganuur Joint Stock Co. (Government, 75%, and public, 25%)	Baganuur Mine, Tov Aymag	3,000
Do.	Government, 95%, and public, 10%	Shivee Ovoo Mine, Dundgovi [Middle Gobi] Aymag	2,000
Do.	SouthGobi Energy Resources Ltd. (Ivanhoe Mines Ltd., 80%)	Ovoot Tolgoi Mine, Omnogovi [South Gobi] Aymag	4,500
Do.	MAK Mongolyn Alt Group, 100%	Eldev Mine, Dornogovi Aymag, 300 km southeast of Ulaanbaatar	500
Do.	do.	Naryn Sukhait Mine, Omnogovi [South Gobi] Aymag, 900 km southwest of Ulaanbaatar	3,000
Do.	Qinhua MAK Naryn Sukhait LLC (Mongolia-China joint venture)	Naryn Sukhait Mine and infrastructure	1,500
Copper, Cu in concentrates	Samsung Corp., 51%, and Erdenet Mining Corp. (Mongolia-Russia Government joint venture), 49%	Erdenet Ovoo open pit mine and processing plant, Bulgan Aymag, 225 km northwest of Ulaanbaatar	20,000
Copper, Cu in cathodes	Erdenet Mining Corp. (Mongolia-Russia joint venture), 51%, and Strand Holdings Ltd., 49%	Erdmin solvent extraction-electrowinning plant	3
Fluorspar	Mongolrostsvetmet LLC	Bor-Undur Mine and processing plant, Hentiy Aymag, 310 km southeast of Ulaanbaatar; 2 underground and 3 open pit mines	450
Do.	do.	Urgen Mine, Dornogovi Aymag, 525 km from Ulaanbaatar	120
Gold kilograms	Centerra Gold, Inc., 100%	Boroo operation; 110 km northwest of Ulaanbaatar	3,000
Do. do.	Java Gold Corp., 100%	Gazar placer gold operation, Tov Aymag, 240 km southwest of Ulaanbaatar	2,000
Limestone	MAK Mongolyn Alt Group, 100%	14 km from the Olon Ovoot station of the Trans Mongolia railway	NA
Molybdenum, Mo in concentrates metric tons	Erdenet Mining Corp. (Mongolia-Russia joint venture)	Erdenet, Bulgan Aymag	3,000
Steel	Darkham metallurgy plant	Darhan, Darhan-Uul Aymag	100
Tungsten metric tons	A state-owned company	Hovd Gol area, Bayan-Olgiy Aymag	150
Zinc, Zn in concentrates	Tsait Minerals Co. Ltd. (China-Mongolia joint venture)	Sukhe Bator, Suhbaatar Aymag	70

[e]Estimated. Do., do. Ditto. NA Not available.

[1]Abbreviations used for units of measure in this table include the following: km—kilometer.

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The Mineral Industry of New Caledonia

By Susan Wacaster

In 2011, about 8% of the world's nickel production came from New Caledonia, as did about 2% of the world's cobalt production. New Caledonia was the world's fifth ranked producer of mined nickel, and its reserves were estimated to be about 12 million metric tons (Mt). The country's cobalt resources were estimated to account for about 4.5% of the world total (Kuck, 2012; Shedd, 2012).

Production

In 2011, New Caledonia produced about 100,400 metric tons (t) of nickel from 5.6 Mt of saprolite ore and about 30,300 t of nickel from 3.2 Mt of laterite ore compared with 104,800 t of nickel from 6 Mt of saprolite ore and about 25,000 t of nickel from 2.7 Mt of laterite ore in 2010. In 2011, the amount of nickel derived from ferronickel production increased by about 0.5% to about 40,000 t. Data on mineral production are in table 1 (Direction de l'Industrie, des Mines et de l'Energie, 2012).

Structure of the Mineral Industry

In 2011, the Goro nickel-cobalt operation was jointly owned by Vale Nouvelle-Calédonie S.A.S. (75%) and Japanese companies Sumitomo Metal Mining Co. Ltd. (11%) and Mitsui Co. Ltd. (10%). The Koniambo nickel project was a joint venture between Société Minière du Sud Pacifique (SMSP) (51%) and Xstrata Nickel (operator, 49%). SMSP continued to be a major nickel ore producer in New Caledonia at its SMSP Laterite Operation (also known as the Sud-Pacifique Mine), which is located northwest of Noumea; the Sud-Pacifique Mine was a joint venture between SMSP (51%) and Pohang Iron and Steel Co. Ltd. (POSCO) of the Republic of Korea (49%). Table 2 is a list of major mineral industry facilities.

Mineral Trade

In 2011, according to the United Nations Commodity Trade Statistics database, New Caledonia exported about 4.4 Mt of nickel ores and concentrates valued at about $302 million; about 45,100 t of nickel oxides and hydroxides valued at about $127 million; approximately 165,000 t of ferronickel in granular or powder form valued at about $847 million; and about 19,700 t of nickel matte, nickel oxide sinter, and other intermediate products of nickel metallurgy valued at $271 million (United Nations Statistics Division, 2012).

Commodity Review

Metals

Nickel and Cobalt.—Throughout most of 2011, Vale Nouvelle-Calédonie continued to ramp up production at its Goro nickel-cobalt project, which is located 58 kilometers east of Noumea in South Province, after commissioning in August 2010. Startup at the mine had been delayed several years, and development costs had almost doubled to about $4 billion. The company reportedly began increasing output in the fourth quarter of 2011 and produced about 4,000 t of nickel in the first 3 months of 2012. By May 2012, Vale Nouvelle-Calédonie had suspended sales and purchases after declaring force majeure following an incident at the mine's sulfuric acid plant. At full production, the mine was expected to be able to produce up to 60,000 metric tons per year (t/yr) of nickel and 4,500 t/yr of cobalt using high-pressure acid leaching to extract the large volumes of low-grade nickel. Proven and probable reserves at Goro included 126.4 Mt of ore grading 1.44% Ni and 0.11% Co.

As of December 31, 2011, measured and indicated resources at the Koniambo nickel project included 75.6 Mt grading 2.47% nickel. The project was expected to process 3 million metric tons per year of limonite and saprolite ore and produce 60,000 t/yr of nickel at full production, which would be reached sometime in 2014 (Thomson Reuters, 2012).

Outlook

New Caledonia is expected to continue to be a globally significant cobalt and nickel producing country, and production is expected to increase as both the Goro and the Koniambo projects commence operations and production is ramped up.

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TABLE 1
NEW CALEDONIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2007	2008	2009	2010	2011
Cement		121,818	137,108	138,114	138,000 r,e	138,000 e
Nickel:						
Ore:						
Gross weight	thousand metric tons	7,575	6,172	5,689	8,709	8,835
Co content		1,620	869	1,000	1,700	1,700 e
Ni content		125,211	102,700	92,500	129,800	130,700
Ferronickel:						
Gross weight		145,000	124,900	114,897	115,000 e	115,000 e
Ni content		44,954	37,467	38,230	39,802	40,015
Nickel matte:						
Gross weight		19,500	18,000	19,000	19,000 e	19,000 e
Ni content		14,842	13,564	13,902	13,917	13,780

eEstimated; estimated data are rounded to no more than three significant digits. rRevised.

[1]Table includes data available through May 22, 2012.

[2]In addition to the commodities listed, crude (unspecified) and crushed stone, construction sand, and silica sand for metallurgical use are produced, but available information is inadequate to make reliable estimates of output.

TABLE 2
NEW CALEDONIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity e
Cement	thousand metric tons	Société des Ciments de Numbo	Noumea	150
Cobalt, in ore and concentrate, Co content		Société Le Nickel (SLN) [Eramet Group, 56%; Société Territoriale Calédonienne de Participation Industrielle (STCPI), 34%; Nisshin Steel Co., 10%]	Kouaoua, Nepoui-Kopeto, Poum, Thio, and Tiebaghi mining centers	2,000
Do.		Société Minière du Sud Pacifique (majority owned by the government of Northern Province)	Boakaine, Ouaco, Poum, and Poya mining centers	1,000
Do.		Groupe Ballande Figesbal, 75%, and Sumitomo Metal Mining Co. Ltd., 25.5%	Figesbal, Noumea	NA
Do.		Vale Nouvelle-Calédonie S.A.S., 75%; Sumitomo Metal Mining Co. Ltd., 11%; Mitsui Co. Ltd., 10%	Goro, 58 kilometers east of Noumea in South Province	4,500
Nickel:				
In ore and concentrate, Ni content		Société Le Nickel (SLN)	Kouaoua, Nepoui-Kopeto, Poum Thio, and Tiebaghi mining centers	61,500
Do.	thousand metric tons	Société Minière du Sud Pacifique, 51%, and Pohang Iron and Steel Co. Ltd. (POSCO), 49%	SMSP Laterite Operation in South Province	2,100
Do.		Société des Mines de la Tontouta, 100%	Moneo and Nakety mining centers	16,000
Do.		Other small nickel mining companies, which includes Société Minière George Montagnat SA (SMGM)	Moneo and Nakety-Bogota, and Tontouta mining centers	7,300
Do.		Sumitomo Metal Mining Co. Ltd., 25.5%	Figesbal, Noumea	NA
Do.		Vale Nouvelle-Calédonie S.A.S., 75%; Sumitomo Metal Mining Co. Ltd., 11%; Mitsui Co. Ltd., 10%	Goro, 58 kilometers east of Noumea in South Province	60,000
In ferronickel, Ni content		Société Le Nickel (SLN) [Eramet Group, 56%; Société Territoriale Calédonienne de Participation Industrielle (STCPI), 34%; Nisshin Steel Co., 10%]	Doniambo, Noumea	60,000
In nickel matte, Ni content		do.	do.	15,000

eEstimated. Do., do. Ditto. NA Not available.

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The Mineral Industry of New Zealand

By Pui-Kwan Tse

The economy of New Zealand continued to grow at a modest rate in 2011, and the gross domestic product (GDP) increased by 1.8%. The earthquakes that struck Canterbury in late 2010 and early 2011 had an adverse effect on the country's economy. The earthquakes caused substantial physical damage to the town, and the cost of reconstruction was estimated to be $20 billion. Reconstruction activities started in late 2011 and would continue during the next several years. New Zealand's trading partners were mainly Australia and other countries in the Asia and the Pacific region. Although the slow economic growth in the European Union had only a limited direct effect on New Zealand's exports, the deteriorating economic conditions in Europe affected the economies of New Zealand's trading partners in the Asia and the Pacific region. New Zealand's economy was expected to grow at a modest pace during the next 2 years (Reserve Bank of New Zealand, 2012, p. 22).

The output of the mineral industry of New Zealand was small compared with that of its neighboring country Australia. New Zealand had metallic mineral occurrences of antimony, bauxite, beryllium, chromium, copper, gallium, gold, iron, lead, lithium, magnesite, manganese, mercury, molybdenum, nickel, platinum-group metals, rare earths, silver, tin, titanium, tungsten, uranium, and zinc. Of these metallic minerals, only gold, iron, and silver were produced. Bentonite, clay, diatomite, dolomite, limestone, perlite, phosphate rock, pumice, salt, silica, building and dimension stone, sulfur, and zeolites had also been discovered in the country (table 1).

New Zealand's total trade increased by 10.4% to NZ$92.2 billion (US$73.8 billion) in 2011. Exports were valued at NZ$47.7 billion (US$38.2 billion), which was an increase of 9.6% from the value in 2010. Imports were valued at NZ$44.5 billion (US$35.6 billion). Australia continued to be New Zealand's leading export destination, accounting for 22.7% of total exports. China replaced the United States as New Zealand's second ranked export market, receiving 12.3% of New Zealand's exports, followed by the United States, 8.4%; Japan, 7.2%; and the Republic of Korea, 3.5%. China replaced Australia as New Zealand's leading source of imports, supplying 15.9% of New Zealand's imports, followed by Australia, 15.7%; the United States, 10.7%; Japan, 6.2%; and Singapore, 4.6%. Crude oil accounted for 4.7% of the country's total export value, and aluminum and its products accounted for 1.8%. Crude oil and oil products were New Zealand's most valuable imported commodities, accounting for 9.6% of the country's total import value. Because it had no alumina refinery, the country imported alumina from Australia for its aluminum production, and alumina imports accounted for 0.7% of the country's total import value (Statistics New Zealand, 2012a, p. 12–22).

Government Policies and Programs

The New Zealand Government expressed its commitment to combating climate change and reducing greenhouse gas emissions in the country under the Kyoto Protocol. One recent policy change was the Government's amendment in 2010 of the New Zealand Standard NZS 3122:2009, Specification for Portland and Blended Cements (General and Special Purpose); this amendment increases the allowable mineral additions to 10% from 5%, and thus enables the clinker factor of general purpose cement to be reduced. This change could reduce carbon dioxide emissions from cement production by 15,000 t/yr.

Minerals in the National Economy

New Zealand's mineral resources were dominated by aggregate and gold, which together accounted for 80% of the total value of New Zealand's mineral resources. Gold, iron sand, and silver were major metallic commodities that made a significant contribution to New Zealand's economy. Production of other metallic minerals, such as bauxite, copper, lead, and zinc, could potentially be economically feasible if technologies and prices become favorable. Excluding the petroleum industry, the value of New Zealand's mining sector accounted for less than 1% of the GDP. The total value of New Zealand's minerals and mineral fuel production accounted for about 2% of the GDP (Statistics New Zealand, 2012b, p. 2).

Production

New Zealand's economy was constrained as a result of a slowdown in household spending that led to reduced activity in the manufacturing and retail sectors. Manufacturing sales fell by 7.1%, driven largely by the decrease in the price of oil. Activity in the construction sector decreased by about 10% in 2011. Production of such mineral commodities as kaolin and pumice increased by more than 10% compared with that of 2010. Mineral commodities for which production decreased significantly included bentonite, coal, dimension stone, dolomite, perlite, crude petroleum, sand and gravel, and silver. Data on mineral production are in table 1.

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities in New Zealand.

Commodity Review

Metals

Aluminum.—New Zealand Aluminum Smelters Ltd. was the sole primary aluminum producer in New Zealand. In October, Rio Tinto Ltd. of Australia announced that New Zealand Aluminum had been placed under a newly established company, Pacific Aluminum. Pacific Aluminum held a 79.36% share of New Zealand Aluminum, and Japan's Sumitomo Chemical Co. held the remaining 20.64% share. In 2011, New Zealand

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Aluminum completed the replacement of all transformers at its reduction line at the Tiwai Point smelter to increase the power delivery level. Aluminum production increased to 354,029 metric tons (t) in 2011 from 343,335 t in 2010. The smelter emitted a large amount of carbon dioxide—1.87 metric tons per metric ton of aluminum metal produced, which is calculated as carbon consumption (anodes) plus anode production plus fuel usage plus perfluorocarbon generation. In line with the Government's plan to reduce greenhouse gas emissions, the company planned to reduce its carbon dioxide emissions in the future. New Zealand Aluminum exported 90% of its aluminum output, mainly to Japan (Rio Tinto Ltd., 2011).

Gold.—New Zealand's gold production was mainly from the Waihi area in the North Island and from the Otago region and along the west coast on the South Island. Hard rock gold mines were mined by Newmont Mining Corp. of the United States on the North Island and OceanaGold Corp. of Australia in the South Island. Newmont Waihi Gold, which was a subsidiary of Newmont Mining, mined the Favona, the Martha, and the Trio Mines in and around Waihi. The mine at Favona was scheduled to be closed later in the year, but mining at the Martha Mine was continuing. The company had received approval from the Government to mine Trio at the end of 2010. The Trio ore bodies were situated between the Martha and the Favona Mines and would be accessed from the Favona portal. Newmont Waihi planned to mine at the deepest level and to work up towards the surface. Mining at Trio was scheduled to begin at the end of 2014. Mined ore from all three mines was being processed at the Martha plant and passed through a series of electrowinning cells where gold and silver were deposited on stainless steel cathode and then put into a furnace. The molten material was poured into a cascade of molds to form dore bullion bars, which were composed of about 10% to 25% gold and 75% to 90% silver. The dore was refined at the Grand Junction refinery (Newmont Mining Corp., 2012, p. 2–10).

OceanaGold's Macraes gold projects in New Zealand included the Macraes open pit mine and the Frasers underground mine on the east coast of the South Island, and the Reefton open pit mine and a 1-million-metric-ton-per-year (Mt/yr) processing plant on the west coast of the South Island. The concentrate from both operations was sent by rail to the Macraes pressure oxidation facility for final processing. The company had estimated that the Macraes and the Reefton operations would be closed in 2019; however, after further exploration at both the Macraes and the Reefton areas, gold resources were increased by 14%, and the company applied to the Otago Regional Council and the Waitaki District Council to extend its mine life permit at Macraes to 2020. In 2011, OceanaGold produced a total of 7.85 t (252,499 troy ounces) of gold from the Macraes and the Reefton Mines (Gold and Minerals Gazette, 2011; OceanaGold Corp., 2012, p. 12).

New Zealand's gold placer mining operations were located mainly on the west coast of the South Island and in the Otago and Southland regions. Waikaia Gold Ltd. received approval from the Government to establish an alluvial gold mining operation on the floodplain of the Waikaia River. The proposed mine path at Waikaia River was about 5 kilometers upstream of the Pyramid Waiparu Road Bridge. The total area of the proposed mine was 5.6 million cubic meters containing indicated and inferred resources of 4.6 t (148,000 troy ounces) of gold. The company planned to mine up to 622 kg (20,000 troy ounces) for 8 years (Waikaia Gold Ltd., 2011, p. 5–10).

L&M Group started its alluvial mining operation at Bannockburn in Otago. The mining area covered 150 hectares (1.5 square kilometers), and the total gold resource was about 3.1 t (100,000 troy ounces). The company received a permit to mine in July 2004; the permit would expire in 2016 (L&M Group, 2011, p. 5).

Iron Ore and Iron and Steel.—New Zealand's iron ore deposits are iron sands, which are placer deposits formed from the erosion of andesitic and rhyolitic volcanic rocks. These iron sands occur in onshore dunes and beaches and in offshore marine sands along the coastline from Kaipara Harbor south to Wanganui on the west coast of the North Island. Iron sand concentrate from Taharoa, which contained about 57% iron, was exported to other countries in the Asia and the Pacific region. Iron sand from the Waikato North Head site was pumped to the Glenbrook steel plant of New Zealand Steel Ltd. (a subsidiary of BlueScope Steel Ltd. of Australia) by way of an 18-km-long underground pipe. The Glenbrook steel plant, which was the sole integrated steel producer in the country, had an output capacity of 650,000 metric tons per year (t/yr).

The Government granted Trans-Tasman Resources Ltd. an exploration license to explore for iron ore deposits off the west coast of the North Island from the Waikato River in the north to the Rangitikei River in the south. Iron sand in the area was vanadium-bearing titanomagnetite. The Government required the company to complete an initial estimate of mineral potential in the exploration area within 48 months (Trans-Tasman Resources Ltd., 2011).

Industrial Minerals

Cement.—New Zealand's cement industry was dominated by two producers—Golden Bay Cement and Holcim New Zealand Ltd., which was a subsidiary of Holcim Ltd. of Switzerland. Owing to the uncertainty of the international financial situation, Holcim postponed a decision on building a new up-to-date technology plant to replace the existing cement plant at Weston (near Oamatu) until 2013. The new $40 million plant would increase production capacity and reduce emissions. Holcim planned to reduce carbon dioxide emissions by 25% below its 1990 benchmark by 2015 (Holcim New Zealand Ltd., 2012).

The Perry Group planned to invest $25 million to construct an 80,000-t/yr cement plant at Te Kumi in the Waitomo region. The company submitted a consent application to the Waitomo District Council for approval. It would take about 18 months for the construction of plant after the consents were granted. The company expected that the cement plant would start production in 2013 (Infonews.co.nz, 2011).

Mineral Fuels

Coal.—New Zealand's coal resources were estimated to be 15 billion metric tons (Gt), of which about 8.6 Gt was economically recoverable. Bituminous coal resources

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are located in the West Coast region of the South Island; subbituminous coal resources are found mainly in the Waikato region of the North Island, as well as in the Otago, the Southland, and the West Coast regions of the South Island. Lignite resources are found in the Otago and the Southland regions of the South Island. The South Island lignite deposits accounted for 80% of the country's coal resources. Coal accounted for about 4% of the country's total energy consumption.

Although lignite accounted for 80% of the country's coal resources, it accounted for only about 6.5% of the total coal output in 2011, and bituminous and subbituminous coal accounted for 47.1% and 46.4%, respectively. Bituminous coal was produced in the West Coast region of the South Island. Subbituminous coal was mainly from the Waikato region of the North Island. Lignite was from the Southland region of the South Island. State-owned Solid Energy New Zealand Ltd. accounted for about 80% of the country's coal output. There were 22 operating coal mines in New Zealand in 2011, of which 4 were underground mines and 18 were opencast mines. About 59% of the output from the 22 mines was from 2 opencast operations at Rotowaro near Huntly and Stockton in the Buller field. New Zealand's coal production decreased by about 7.3% in 2011 compared with production in 2010. The decrease in coal output was the result of safety problems at Solid Energy's Spring Creek Mine. New Zealand exported nearly all its bituminous coal output from the South Island. In 2011, New Zealand exported 2.2 Mt of bituminous coal; most of the exported coal went mainly to India and Japan, although a small quantity went to Brazil, Chile, China, South Africa, and the United States. New Zealand imported 171,000 t of coal in 2011, most of which was subbituminous coal used for the Huntly powerplant (Ministry of Economic Development, 2012).

Natural Gas and Oil.—New Zealand's natural gas and oil were produced from 19 fields, all of which were located in the Taranaki Basin. Natural gas was produced from 13 of these fields. In 2011, New Zealand's natural gas and oil production decreased by more than 7% and 14%, respectively, compared with that of 2010. Natural gas production decreased at the Maari, the Maui, and the Tui fields. The decrease in gas production was caused by shutdowns for maintenance and reductions in seasonal demand. In 2011, New Zealand was a net importer of 22.6 million barrels (Mbbl) of oil. About 59% of the imported oil was from Middle Eastern countries, and about 28% was from Asian countries, mainly Brunei and Indonesia. The Government extended the tax exemption for exploration companies until December 31, 2014, to encourage exploration for offshore hydrocarbons in New Zealand territory (Ministry of Economic Development, 2012).

Outlook

Most mineral production in New Zealand is consumed locally, with the exception of aluminum, coal, gold, and amorphous silica. Coal and gold are the leading exported mineral commodities. The Government proposed to remove some mineral exploration restrictions on public areas where the mineral potential was significant and mineral production could contribute significantly to the economy of New Zealand. The development of the mining sector in New Zealand, however, is constrained by the population's environmental awareness, the ecological sensitivity of the country, and New Zealand's location far from major industrial markets. Consistent with these trends, New Zealand's mineral development is expected to continue to increase only gradually.

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TABLE 1
NEW ZEALAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011
METALS						
Aluminum metal, smelter:						
Primary		351,100	315,500	271,902	343,335	354,029
Secondary[e]		22,000	22,000	22,000	22,000	22,000
Total[e]		373,000 r	338,000 r	294,000 r	365,000	376,000
Gold, mine output, Au content	kilograms	10,628	13,403	13,442	13,494 r	14,324
Iron and steel:						
Iron sand, titaniferous magnetite, gross weight	thousand metric tons	1,723	2,020	2,092	2,439	2,357
Pig iron[e]	do.	679	622	608	667	659
Steel, crude[e]	do.	845	799	765	853	844
Lead, refinery output, secondary[e]		7,000	9,000	13,000	9,000	9,000
Silver, mine output, Ag content	kilograms	10,568	18,269	14,264	17,136 r	14,324
INDUSTRIAL MINERALS						
Cement, hydraulic[e]	thousand metric tons	1,200	1,200	1,200	1,100	1,200
Clays:						
Bentonite		6,154	753	880	1,216	--
Kaolin, pottery		14,130	12,761	9,016	10,700 e	21,545
For brick and tile		55,645	34,650	40,740	30,192	10,911
Diatomaceous earth		14	14	10	95	--
Lime[e]		20,000	20,000	20,000	19,000	19,000
Marble[e]		15,000	15,000	15,000	14,000	14,000
Nitrogen, N content of ammonia[e]		125,000	125,000	125,000	120,000	120,000
Perlite		7,873	--	8,848	5,088	--
Pumice		354,903	174,729	159,357	118,249	229,268
Salt[e]		100,000	100,000	100,000	95,000	95,000
Sand and gravel:						
Silica sand, glass sand		86,461	48,575	43,458	113,231	109,346
Other industrial sand		1,896,343	1,160,543	1,453,793	1,726,236	1,203,103
For roads and ballast	thousand metric tons	23,782	20,889	15,471	13,257 r	14,757
For building aggregate	do.	9,601	9,743	8,064	7,528 r	6,000
Stone:						
Dolomite		62,770	16,962	52,000	86,399	59,782
Limestone and marl:						
For agriculture	thousand metric tons	2,180	1,918	2,020	1,686	1,373
For cement	do.	1,965	2,018	1,888	1,686 r	1,373
For other industrial uses	do.	947	874	664	1,054	185
Serpentine		45,648	4,494	14,197	43	41
Dimension		22,934	16,998	17,795	18,911	140
Zeolite		17,039	25,800	21,750	--	--
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades	thousand metric tons	4,835	4,909	4,563	5,330	4,944
Liquefied petroleum gas	thousand 42-gallon barrels	1,263	979	857	1,200	1,200
Natural gas:						
Gross production	million cubic meters	4,712	4,484	4,644	5,052	4,678
Marketed production	do.	4,310	3,994	4,097	4,432	4,003
Petroleum:						
Crude	thousand 42-gallon barrels	15,011	21,436	20,026	19,302	16,591
Refinery products[e]	do.	35,000	34,000	35,000	34,000	33,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.
[1]Table includes data available through August 10, 2012.

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TABLE 2
NEW ZEALAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities	Annual capacity[e]
Aluminum		Tiwai Point smelter [New Zealand Aluminium Smelters Ltd. (Pacific Aluminum, 79.36%, and Sumitomo Chemical Co., 20.64%)]	Southland, Invercargill	350
Cement		Golden Bay Cement (Fletcher Building Ltd.)	Portland	900
Do.		Holcim New Zealand Ltd.	Cape Foulwind, Westport	500
Coal		Stockton open pit mine (Solid Energy New Zealand Ltd., 51%, and Cargill Inc., 49%)	Buller, 35 kilometers northeast of Westport	2,500
Do.		Pike River underground mine (Pike River Coal Ltd.)	50 kilometers northeast of Greymouth	1,000
Do.		Spring Creek underground mine (Solid Energy New Zealand Ltd.)	Greymouth	1,000
Do.		Rotowaro open pit mine (Solid Energy New Zealand Ltd.)	Huntly	1,500
Do.		Huntly East underground mine (Solid Energy New Zealand Ltd.)	do.	500
Do.		New Vale open pit mine (Solid Energy New Zealand Ltd.)	50 kilometers northeast of Invercargill	300
Do.		Ohai open pit mine (Solid Energy New Zealand Ltd.)	Ohai	200
Do.		Terrace underground mine (Solid Energy New Zealand Ltd.)	Reefton	100
Gold	metric tons	Newmont Waihi Gold (subsidiary of Newmont Mining Corp.)	Waihi	5
Do.	do.	Macraes gold project (OceanaGold Corp.)	Otago	6
Do.	do.	Reefton gold project (OceanaGold Corp.)	Reefton	10
Iron and steel:				
Iron ore		New Zealand Steel Ltd. (BlueScope Steel Ltd. of Australia)	Taharoa, 150 kilometers south of Auckland	1,300
Do.		do.	Waikato North Head, 30 kilometers south of Auckland	1,000
Steel		do.	Glenbrook	650
Do.		Otahuhu Mill [Pacific Steel Group (Fletcher Building Ltd.)]	Auckland	300
Kaolin		Imerys Tableware New Zealand Ltd.	80 kilometers northwest of Whangarei	25
Petroleum, refinery	barrels per day	Marsden Point Oil Refinery (New Zealand Refinery Co., operator)	Marsden Point	95,000
Salt		Dominion Salt Ltd.	South of Blenheim	70
Silver	metric tons	Newmont Waihi Gold (Newmont Mining Corp.)	Waihi	30
Do.	do.	OceanaGold Corp.	Otago	1

[e]Estimated. Do., do. Ditto.

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The Mineral Industry of Pakistan

By Chin S. Kuo

Pakistan is rich in such mineral resources as barite, coal, copper, iron ore, limestone, and salt, and the identified resources of copper and iron ore are large. The country produced a variety of industrial minerals and some metallic minerals. Pakistan also has extensive energy resources and is known to have moderate oil reserves, sizable gas reserves, the potential for coal, and large hydropower potential. In the past several years, gas and oil production met only about one-half of the country's energy needs, but exploitation of energy resources continued to be slow owing to a shortage of capital and to political instability.

The Pakistan National Tariff Commission announced a tax to control the exportation of scrap metals, such as copper, zinc, and other metals. China was a major importer of such materials from Pakistan. The recent increase in Pakistan's exports of these materials led to increased domestic metal prices, which damaged the interests of domestic manufacturers (Ni, 2011).

Minerals in the National Economy

In 2011, Pakistan's economy was dominated by the services, industrial, and agriculture sectors, which accounted for 53%, 26%, and 21% of the gross domestic product (GDP), respectively. Industrial output increased at a rate of 3%, and construction materials accounted for much of that output. Production from mining and quarrying accounted for 10% of industrial production and increased by 16% compared with that of 2010. The value of output from the mineral industry accounted for 2.5% of the GDP, which posted a growth rate of 2.4% in 2011.

Cement and jewelry were the country's major export items in 2010. Pakistan's oil production was not sufficient to meet its domestic demand. Aluminum, crude petroleum, iron and steel, and petroleum products were the major import commodities (State Bank of Pakistan, 2012).

Production

The metallic minerals mined in Pakistan included bauxite, chromite, copper, and iron ore. Production of crude steel was estimated to have increased by 9.1% in 2011 owing to higher capacity utilization. The country produced lead and zinc concentrates for the first time in 2009; production was from the Duddar Mine. Zinc in concentrate from the mine was reported to be only 10 metric tons (t) in 2010 and was estimated to have increased to 15 t in 2011. Pakistan produced a variety of industrial minerals, including aragonite, barite, clays, dolomite, gypsum, limestone, and salt. In 2011, the estimated increased output of limestone was used mainly in the cement industry. Production of chalk was estimated to have increased by 51% in 2011 after steady increases followed by a sharp drop in 2010, and production of fuller's earth and caustic soda was also estimated to have increased. Output of talc, magnesite, and phosphate rock was estimated to have decreased by 18%, 16%, and 9%, respectively (table 1).

Structure of the Mineral Industry

The Mineral Department of the Ministry of Petroleum and Natural Resources is responsible for the exploration, planning, development, and operation of mining ventures that are controlled by the state-owned companies. The Ministry's Petroleum Department is responsible for the exploration and production of hydrocarbons and for the transmission and distribution of natural gas. State-owned companies control the production and marketing of chromite, coal, copper, iron ore, and steel. Private-sector companies are allowed to own and produce nonfuel minerals—mainly industrial minerals, including cement. Despite the Government's efforts to privatize large-scale state-owned companies, the public sector companies continued to account for a significant amount of mineral production. Table 2 is a list of major mineral producing facilities in the country.

Commodity Review

Metals

Copper and Gold.—The Provincial government of Balochistan rejected a mining lease application for the Reko Diq copper-gold project from Antofagasta Minerals of Chile and Barrick Gold Corp. of Canada owing to an incomplete feasibility report submitted in February 2011. The joint-venture company set up by Antofagasta and Barrick, Tethyan Copper Co. Pty. Ltd., filed a notice of dispute with the Province regarding the project. Tethyan Copper had a 75% interest in the project. The Reko Diq deposit held an estimated mineral reserve of 5,900 million metric tons (Mt) with an average grade of 0.41% copper and 0.22 gram per metric ton (g/t) gold. The joint-venture partners had spent $200 million in 2006 to buy the exploration license from BHP Billiton Ltd. of Australia. The construction cost for the Reko Diq project was projected to be $3.3 billion. The project was likely to employ 11,000 people at its peak operation and was expected to produce 200,000 metric tons per year (t/yr) of copper and about 7,800 kilograms per year (kg/yr) of gold. The start of production was originally scheduled for 2015 (Ferreira-Marques, 2011).

In rejecting the Reko Diq mining lease application, the government of Balochistan said that metal refining must be done in the Province, that any agreement must specify what would be extracted and exported, and that the agreement must be beneficial for the local people. The Provincial government indicated that a financially better deal was being sought. This decision could clear the way for Metallurgical Construction Corp. (MCC) of China, which had started the Saindak copper-gold project in Chagai District, to secure a mining lease for Reko Diq. MCC would give the Balochistan government a 25% share in the income and 5% royalty. MCC also offered to construct roads and set up a powerplant

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at the mine site. Tethyan Copper commenced international arbitration proceedings regarding the dispute. The arbitration body could not force the Balochistan government to award the mining lease to the company, but could help Tethyan Copper secure compensation for funds it had invested in the project (Fazi-e-Haider, 2011).

Iron and Steel.—Pakistan Steel Mills Corp. Ltd. (PSM) reported that a large quantity of steel products, such as hot-rolled coils and galvanized coils, was being smuggled into Pakistan across the Afghanistan and Iran borders and sold at much lower prices on the black market. As a result, the sale of PSM steel products was severely affected, and the Government lost revenues owing to nonpayment of duties and taxes. Imports of scrap were not subject to the customs duty and sales tax (Steelguru.com, 2011).

Lead and Zinc.—Extensive lead-zinc-barite mineralization was discovered in the ophiolite thrust belt on the upper part of the lower Jurassic Shirinab Formation at Las Bela in Balochistan Province. Mineralization was identified at Duddar, Gunga, Mal Khor, Rang Laki, Shekran, and Surmai. Deposits at Duddar, Gunga, and Surmai had been explored and evaluated. At Duddar, barite was an indicator of sulfide mineralization. Pakistan Mineral Development Corp. and MCC were developing the mine and constructing the beneficiation plant at Duddar. The mine was expected to produce 5,000 t/yr of zinc and between 25,000 and 30,000 t/yr of lead in concentrate, and the plant would have a processing capacity of 660,000 t/yr of ore (MBendi.com, 2011).

Industrial Minerals

Cement.—In 2011, Pakistan's exports of cement decreased by 12.5% to 9.4 Mt. Cement exports went mainly to countries of the Middle East as well as to the neighboring countries of Afghanistan and India. The leading exporters were Askari Cement Co. Ltd., Bestway Cement Co. Ltd., Cherat Cement Co. Ltd., DG Khan Cement Co. Ltd., Kohat Cement Co. Ltd., and Lucky Cement Ltd. Bestway Cement bought additional shares of Mustehkam Cement Ltd. and increased its stake in the company to 95.03%. Bestway Cement had acquired an 85.29% interest in Mustehkam Cement in 2005. Mustehkam Cement operated a 600,000-t/yr cement plant at Haripur in Khyber-Pakhtunkhwa. Bestway Cement planned to increase the plant's capacity to 1.2 million metric tons per year (Mt/yr) (International Cement Review, 2011).

All Pakistan Cement Manufacturers Association appealed to the Government to rescue the ailing cement industry. The cement industry suffered losses mainly owing to increases in production costs, including the prices of coal, diesel, electricity, furnace oil, paper bags, and transportation, as well as higher interest rates. Stagnant domestic demand and decreased exports also hurt the performance of the industry. Capacity utilization was low at 75% (Global Cement Weekly, 2011).

Fauji Cement Co. Ltd. opened its new cement plant at Jhang Bahtar, which had an installed capacity of 7,200 metric tons per day (t/d) of clinker, and increased its cement production capacity to 2.2 Mt/yr from 1.1 Mt/yr. The cement plant was located near a new powerplant that had been built at the Diamer Bhasha dam. The Asian Development Bank invested $4.5 billion in construction of the dam, which was projected to require 5 Mt/yr of cement for several years (Cemweek, 2011).

Lucky Cement was Pakistan's leading cement producer and exporter. The company's facility at Pezu had a production capacity of 13,000 t/d of dry-process cement, and the facility at Karachi had a production capacity of 12,000 t/d, for a total capacity of 25,000 t/d, or 7.75 Mt/yr. The company planned to form a joint venture with Groupe Rawji of the Democratic Republic of the Congo [Congo (Kinshasa)] to build a $175 million 1-Mt/yr cement plant in that country. Lucky Cement would pay $40 million for a 50% stake in the project (Sharif and Kavanagh, 2011).

Soda Ash.—ICI Pakistan, which was a subsidiary of Akzo Nobel N.V. of the Netherlands, planned to invest $23.2 million in its Khewra soda ash plant in Jhelum. The money would be used to purchase two steam boilers powered by coal instead of natural gas. Interrupted gas supply was the major factor in the investment decision. Once the project is completed and commissioned in January 2013, the plant would have the capacity to produce 350,000 t/yr of soda ash. When powered with natural gas, the plant had a capacity of 285,000 t/yr after an expansion in 2007. ICI Pakistan supplied 70% of the domestic market and exported to neighboring countries (Lismore, 2011).

Mineral Fuels

Coal.—Oracle Coalfields plc of the United Kingdom planned to develop a 1,400-Mt coal resource in Sindh Province. Its 80%-owned subsidiary Sindh Carbon Energy Ltd. submitted an application for a 30-year mining lease with a 30-year extension for the Block VI Thar coalfield project. The application for the mining lease was submitted to the Thar Coal Energy Board of the Sindh Coal Authority. As part of the supporting technical documentation, an interim environmental and social impact assessment report was also included. The subsidiary had an exploration license for the block (London Stock Exchange plc, 2011).

Natural Gas and Petroleum.—BP p.l.c. was selling most of its assets in Pakistan to the Hong Kong-based United Energy Group for $775 million. The sale was expected to be completed in the first half of 2011. The assets included nine producing and exploration blocks in Sindh Province and four offshore exploration blocks in the Arabian Sea. The blocks held energy resources of 43.1 million barrels of oil equivalent. BP produced 10,000 barrels per day of oil and 5.66 million cubic meters per day of gas in Pakistan (Petroleum Economist, 2011).

Outlook

Pakistan's Reko Diq copper-gold project was at the point of being developed, but the project now is expected to be delayed owing to the rejection of a mining lease by the Provincial government. MCC is likely to proceed with securing the mining lease because of its success in developing the Saindak copper-gold project. The country's production of lead and zinc concentrates is expected to increase gradually as the mining operation at Duddar (also operated by MCC) gets underway. The cement industry is expected to add production capacities by

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expansions and new plants despite the sluggish cement demand and exports in 2011. Development and mining of coal resources in the Thar District in Sindh Province is expected to proceed. The supply of natural gas from domestic sources is expected to begin to decline in the next 2 to 3 years, as the existing fields are nearing depletion. The Government is reviewing its gas development policy and encouraging foreign companies to participate in gas production.

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TABLE 1
PAKISTAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011[e]
METALS						
Bauxite, gross weight		27,382	25,000 [e]	11,300 [r]	9,576 [r]	10,000
Chromium ore:						
Gross weight		108,000 [e]	104,000	133,000 [r]	252,000 [r]	250,000
Cr_2O_3 content		48,600 [e]	46,800	59,900 [r]	113,400 [r]	112,000
Copper, mine, Cu content[e]		18,800	18,700	18,500	18,000	19,000
Iron and steel:[e]						
Iron ore, gross weight	thousand metric tons	207 [2]	250	333 [r,2]	418 [r,2]	400
Pig iron	do.	1,001 [2]	1,000	700 [r]	483 [r,2]	500
Steel, crude	do.	1,090 [2]	1,100	1,100	1,100	1,200
Lead:[e]						
Pb content in concentrate		--	--	26,000	26,000	27,000
Refined, secondary		3,000	3,000	85 [r,2]	2,889 [r,2]	2,800
Zinc, Zn content in concentrate		--	--	1	10	15
INDUSTRIAL MINERALS						
Abrasives, natural, emery[e]		150	150	150	150	150
Barite		48,044	56,500	56,333 [r]	49,038 [r]	50,000
Cement, hydraulic[e]	thousand metric tons	25,745 [2]	26,000	28,000	30,000	32,000
Chalk		2,892	5,000 [e]	8,343 [r]	1,322 [r]	2,000
Clays:						
Bentonite		32,382	31,500	33,300 [r]	42,100 [r]	40,000
Fire clay		337,071	359,500	359,200 [r]	307,300 [r]	300,000
Fuller's earth		12,884	10,500	11,055 [r]	6,370 [r]	8,000
Kaolin, china clay		25,654 [r]	24,500	15,318 [r]	27,265 [r]	26,000
Other[e]		218,000	220,000	250,000	240,000	260,000
Feldspar		13,236	28,500	61,858 [r]	68,018 [r]	65,000
Fluorspar[e]		2,082 [2]	1,700	1,400	1,500	1,600
Gypsum, crude		703,137	730,000	856,000 [r]	946,000 [r]	950,000
Magnesite, crude		2,370	3,500	3,918 [r]	8,330 [r]	7,000
Nitrogen, N content of ammonia[e]		2,250,000	2,300,000	2,350,000	2,400,000	2,450,000
Phosphate rock:						
Gross weight		3,840	3,900	30,467 [r]	87,807 [r]	80,000
P_2O_5 content[e]		690	700	5,480 [r]	15,800 [r]	14,400
Pigments, mineral, natural, ocher[e]		6,000	6,000	6,200	6,000	6,100
Salt:						
Rock	thousand metric tons	1,833	1,883	1,941 [r]	2,058 [r]	2,000
Marine[e]	do.	18	50 [r]	93 [r,2]	190 [r,2]	200
Total[e]	do.	1,850	1,930 [r]	2,034 [r,2]	2,248 [r,2]	2,200
Sodium compounds, n.e.s.:[e,3]						
Caustic soda		230,000	240,000	250,000	177,000 [r]	200,000
Soda ash, manufactured		260,000	250,000	260,000	394,000 [r]	400,000
Stone:						
Aragonite and marble		1,581,369	1,341,000	1,223,387 [r]	1,471,014 [r]	1,500,000
Dolomite		333,082	305,000	150,619 [r]	306,940 [r]	300,000
Limestone	thousand metric tons	31,046	32,488	35,375 [r]	17,984 [r]	25,000
Other, as "ordinary stone"[e]	do.	5	6	7	7	8
Strontium minerals, celestite		1,476	1,000	--	--	--
Sulfur, native[e]		22,000	28,000	29,000	30,000	31,000
Talc and related materials, soapstone		32,675	26,000	40,792 [r]	121,800 [r]	100,000

See footnotes at end of table.

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TABLE 1—Continued
PAKISTAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011[e]
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades	thousand metric tons	3,926	3,691	3,292 [r]	3,429 [r]	3,600
Coke	do.	308	310	320	322 [r]	330
Gas, natural:						
Gross production	million cubic meters	40,579	41,261	41,658	42,000 [e]	43,000
Marketed production, sales[e]	do.	37,000	38,000	39,000	40,000	41,000
Natural gas liquids[e]	thousand 42-gallon barrels	750	750	750	760	760
Petroleum:						
Crude	do.	25,109	24,818	23,870	71,700 [r]	70,000
Refinery products:[e]						
Gasoline	do.	11,000	11,152 [2]	11,161 [2]	11,000	12,000
Jet fuel	do.	9,800	7,868 [2]	7,584 [2]	7,100 [r,2]	7,000
Kerosene	do.	1,100	1,527 [2]	1,217 [2]	990 [r,2]	1,000
Distillate fuel oil	do.	30,000	32,000	31,000	32,000	31,000
Residual fuel oil	do.	23,500	21,369 [2]	18,615 [2]	20,000	21,000
Lubricants	do.	1,500	3,759 [2]	3,689 [2]	1,375 [r,2]	2,000
Other	do.	14,000	15,000	16,000	17,000	18,000
Total	do.	90,900	92,700	89,300	89,500 [r]	92,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.
[1]Table includes data available through August 8, 2012.
[2]Reported figure.
[3]Not elsewhere specified.

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TABLE 2
PAKISTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Barite		Bolan Mining Enterprises	Khuzdar, Balochistan Province	24
Do.		Razvi Mining (Private) Ltd.	Gandori, Kalan, and Retri	30
Cement		Askari Cement Co. Ltd.	Nizampur	1,200
Do.		Attock Cement Pakistan Ltd.	Hub Chowki	800
Do.		Cherat Cement Co. Ltd.	Nowshera	750
Do.		Dandot Cement Co. Ltd.	Dandot	500
Do.		Fauji Cement Co. Ltd.	Jhang Bahtar	1,170
Do.		do.	do.	2,200
Do.		Gharibwal Cement Ltd.	Jhelum	540
Do.		Javedan Cement Ltd.	Karachi	600
Do.		D.G. Khan Cement Co. Ltd.	Chakwal and Dera Ghazi Khan	1,650
Do.		Kohat Cement Co. Ltd.	Kohat	700
Do.		Lucky Cement Ltd.	Karachi	3,750
Do.		do.	Pezu	4,000
Do.		Maple Leaf Cement Factory Ltd.	Daudkhel	1,500
Do.		Mustehkam Cement Ltd.	Haripur	600
Do.		Pakistan Cement Co.	Between Islamabad and Lahore, Punjab Province	2,200
Do.		Pioneer Cement Ltd.	Chenki	1,300
Do.		Thatta Cement Co. Ltd.	Thatta	300
Do.		Zeal Pak Cement Factory Ltd.	Hyderabad	1,080
Chromite		Pakistan Chrome Mines Ltd.	Gwal, Khanozai, Muslim Bagh, and Nisai, Balochistan Province	20
Coal		Sindh Coal Authority	Dadu, Sindh Province	4,000
Do.		do.	Tharparkar, Sindh Province	NA
Copper, metal		Saindak Metals Ltd. [Metallurgical Construction Corp. (MCC), operator]	Chaghi, Balochistan Province	22
Gas, natural	million cubic meters per day	Pakistan Petroleum Ltd. (PPL)	Adhi, Punjab Province; Kandhkot and Mazarani, Sindh Province; and Sui, Balochistan Province	24
Do.	do.	Oil and Gas Development Co. Ltd. (OGDC)	37 oilfields and gasfields, including Mari, Sindh Province	31
Lead and zinc, ore		MCC Duddar Minerals Development Co. Pvt.	Duddar, Balochistan Province	660
Petroleum:				
Crude	42-gallon barrels per day	Pakistan Petroleum Ltd. (PPL)	Adhi, Punjab Province	1,600
Do.	do.	Oil and Gas Development Co. Ltd. (OGDC)	37 oilfields and gasfields	46,000
Refined	do.	Bosicor Pakistan Ltd.	Karachi	30,000
Do.	do.	Pak-Arab Refinery Co. Ltd. (joint venture of the Governments of Pakistan and the Emirate of Abu Dhabi in the United Arab Emirates)	Mahmood Kot, Punjab Province	100,000
Steel, crude		Pakistan Steel Mills Corp. (Pvt) Ltd. (PSM)	Karachi	1,100

[e]Estimated. Do., do. Ditto. NA Not available.

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The Mineral Industry of Papua New Guinea

By Susan Wacaster

In 2011, copper and gold were the major mineral commodities produced in Papua New Guinea. The country was estimated to be the 11th ranked producer of gold in the world, and it accounted for about 2.6% of the world's gold production. Papua New Guinea also has deposits of chromite; cobalt and nickel in laterite ores; and molybdenum in porphyries, dikes, and veins on the mainland and offshore (George, 2012).

Minerals in the National Economy

Papua New Guinea's economic growth was strong in 2011. The growth was driven by high export commodity prices; by increased Government expenditures; and by the construction phase of the PNG LNG project, which was a major liquefied natural gas (LNG) project jointly financed by Exxon Mobil Corp. of the United States (32%), Oil Search Ltd. of Australia (29%), Independent Public Business Corp. of Papua New Guinea (16.6%), Santos Ltd. of Australia (13.5%), and others. The nominal value of sales decreased in the manufacturing, mineral, and retail sectors, however, which offset increases in the agriculture, building and construction, financial business, fishery, forestry, transportation, and wholesale sectors. The country's total year-on-year sales receipts decreased marginally, by 0.6% (Bank of Papua New Guinea, 2011, p. 2, 7).

In the mineral sector, year-on-year sales receipts decreased by 9.9% compared with that of 2010 owing to a shutdown at the Lihir gold mine, decreased production at the Hidden Valley Mine, and decreased metal grade and disruptions at the Porgera gold mine. The earthquake that struck Japan in 2010 also resulted in Japanese buyers declaring force majeure on contracted sales in 2011. In the building and construction sector, year-on-year sales receipts increased by 113.2%. The increase was accounted for by maintenance and upgrades to roads by the Government and donor agencies, a new contract with the Ok Tedi Mine for road maintenance, and ongoing construction activity associated with the PNG LNG project and other building projects undertaken by the private sector (Bank of Papua New Guinea, 2011, p. 2, 8).

Employment decreased in the agriculture, fishery, forestry, and manufacturing sectors whereas it increased in the building and construction, business, financial, mineral, retail, and wholesale sectors. In 2011, the country's level of employment increased by 6.5%. In the mineral sector, the level of employment increased by 8.6% because of recruitment of skilled workers for the installation of pipelines from the southern highlands to the Central Province for the PNG LNG project. Higher international prices for Papua New Guinea's mineral exports and most of its agricultural exports resulted in a 14.0% increase in the weighted average price of all exports in 2011 compared with that of 2010 (Bank of Papua New Guinea, 2011, p. 2–3, 9–10).

Government Policies and Programs

The Mineral Resources Authority Act of 2005 provided for the establishment of the Mineral Resources Authority and defined the agency's powers and functions. Those functions included (1) promoting the development and exploitation of the country's mineral resources; (2) overseeing the administration and enforcement of the Mining Development Act of 1955, the Mining Act (Bougainville Copper Agreement) of 1967, the Mining Safety Act of 1977, the Mining Act of 1992, the Ok Tedi Agreement, and any other legislation relating to the development of Papua New Guinea's mineral resources; and (3) acting as the agent for the state as required in relation to any international mining agreement. Mineral resources in Papua New Guinea are owned by the state. Complicated land ownership regimes exist in Papua New Guinea because there is no system of land title for customary land. The concept of landholder ownership of mineral resources has been promoted by communities in Papua New Guinea but strongly opposed by the Government (Mineral Resources Authority of Papua New Guinea, 2012, p 10).

Production

Copper production decreased in 2011 by 18% compared with that of 2010 because of lower ore grades at the aging Ok Tedi Mine, and the shutting down of the mill on two occasions, including one 28-day period following the rupture of a pipeline carrying high-sulfur waste. Shipments of copper and gold from the mine were 10% lower than in 2010 because of the decrease in production. Data on mineral production are in table 1 (Ok Tedi Mining Ltd., 2012).

Structure of the Mineral Industry

Several private international mining companies were majority owners or shareholders in producing metals operations in Papua New Guinea, including Newcrest Mining Ltd. of Australia, which wholly owned the Lihir Island Mine. Harmony Gold Mining Co. Ltd. of South Africa had a 50-50 joint-venture partnership with Newcrest Mining in the Hidden Valley Mine, from which the Government received a royalty of 2%. Barrick Gold Corp. of Canada operated and held a 95% interest in the Porgera Mine, and the Government held the remaining 5% share through the state-owned Mineral Resources Development Corp. New Guinea Gold Corp. of Canada was the operator of and held a 92% interest in the Sinivit Gold Mine and Gold Mines of Niugini Holdings Pty Ltd. of Papua New Guinea held the remaining 8% interest. The Ok Tedi Mine was operated by the PNG Sustainable Development Program Ltd., which held a 70% share in the operation; the Government held the remaining 30% share.

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Mineral Trade

In 2011, mineral export receipts, excluding crude oil, accounted for 56.5% of total merchandise exports compared with 61.2% in 2010. Crude oil exports accounted for 15.1% of total merchandise exports in 2011 compared with 14.2% in 2010. The increase was associated with high international commodity prices and demand for mineral commodities from China and India. The volume of mineral exports decreased by 2.1% compared with that of 2010, but the decrease in volume was offset by an increase in prices. The export volume of gold decreased by 17.1% in 2011 to 51.0 metric tons (t) because of decreased production. The export volume of copper decreased by 7.2% to 143,600 t because of the lower grade ore at Ok Tedi Mine combined with the shutdown of the mine's production plant when the pipeline carrying high-sulfur waste was damaged. The export volume of crude oil decreased by 15.5% to 8.8 million barrels compared with that of 2010 because of declining oil reserves at the Gobe main, the Kutubu, the Moran, and the South East Gobe oil fields. In turn, the export receipts for refined petroleum products decreased by 23.2% compared with that of 2010 (Bank of Papua New Guinea, 2011, p. 13–14).

Commodity Review

Metals

Cobalt and Nickel.—The Ramu nickel and cobalt project [a joint venture between China's MCC Ramu NiCo Ltd. (85%), Highlands Pacific Ltd. of Australia (8.56%), and Mineral Resources Development Corp. (6.44%)] was precommissioning in 2011. By December, Highlands reported that the first and third high-pressure acid leach (HPAL) trains at the Basamuk treatment plant had been tested and commissioned with hot water. The HPAL #3 unit would be the first to be commissioned with ore, and HPAL #1 would follow. The proposal for ramping up production was to use these two circuits initially, and to bring the final circuit online gradually until the nameplate output of 31,150 metric tons per year (t/yr) of nickel and 3,000 t/yr of cobalt as a mixed hydroxide product was reached. Also in December, the Supreme Court of Papua New Guinea reportedly rejected an appeal to prevent operation of the deepsea tailings placement system for the Ramu operation, which ended 2 years of appeals by parties concerned about the potential damaging effects to the water quality and lands surrounding the bay where the tailings would be released (Highlands Pacific Ltd., 2011).

Copper.—In 2011, the Ok Tedi Mine produced 130,456 t of copper from 19.5 million metric tons (Mt) of ore compared with 159,821 t of copper from 22.1 Mt of ore in 2009. A rupture in the pyrite concentrate pipline required the company to process low-sulfur and lower grade ore, which resulted in a decrease in the metal head grade to 0.78% from 0.84% in 2010 (Ok Tedi Mining Ltd., 2012).

Gold.—In 2011, the Hidden Valley Mine produced about 3,118 kilograms (kg) of gold and about 20,934 kg of silver compared with 465 kg of gold and 2,423 kg of silver in 2010, which was the operation's startup year. The Porgera Mine produced about 15,600 kg of gold in 2011 compared with about 17,000 kg in 2010. The Ok Tedi Mine produced about 13,000 kg of gold in 2011 compared with about 15,000 kg in 2010 (Barrick Gold Corp., 2012, p. 14; Harmony Gold Mining Co. Ltd., 2012, p. 71; Ok Tedi Mining Ltd., 2012).

Mineral Fuels

Natural Gas.—According to Oil Search Ltd., the PNG LNG project was on track for its first sales in 2014. Major construction at the plant site in Port Moresby began in 2011, and structural work for the two LNG trains was also started. More than one-half of the pilings for a 2.4-kilometer (km) jetty were in place by yearend, and deliveries of major equipment commenced in the second half of the year. Construction of the offshore pipeline commenced after an offshore installation vessel was mobilized. By yearend, 135 km of the 407-km offshore pipeline had been laid. Construction of the onshore pipeline had commenced in 2010 and was continuing in 2011. Welding was completed on 106 km of the onshore pipline, including 75 km that was buried and backfilled. By yearend, all pipeline material had been delivered to Papua New Guinea and preconstruction surveys for the 292-km onshore pipeline had been completed (Oil Search Ltd., 2012, p. 22).

Outlook

Papua New Guinea is a mineral-rich nation, and its economy is expected to continue to show positive economic growth in the short term if commodity prices remain high and construction of the PNG LNG project continues. The PNG LNG project is expected to increase the GDP of the country by 20% by 2015. Real GDP growth is then projected to decrease significantly as the project's construction slows, as extraction from some of the country's aging oilfields wind down, and as the Ok Tedi Mine is depleted. National elections were scheduled to take place in 2012, and critical issues that concern the mineral industry, such as the development of a sovereign wealth fund and landowner rights, are likely to be significant issues in the election (International Monetary Fund, 2011, p. 4, 6).

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TABLE 1

PAPUA NEW GUINEA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		2007	2008	2009	2010	2011[e]
Copper, mine output, Cu content	metric tons	169,184	159,650	166,700	159,821 [r]	130,000
Gas, natural, marketed	million cubic meters	142	113	100	100 [e]	100
Gold, mine output, Au content	kilograms	57,549	67,463	63,600	62,900	62,200
Petroleum, crude	thousand 42-gallon barrels	15,418	13,993	12,806	12,500 [e]	12,500
Silver, mine output, Ag content	kilograms	48,677	51,300	50,000	46,000	45,000

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised.

[1]Table includes data available through July 20, 2012.

[2]In addition to the commodities listed, cement, construction materials (common clays, sand and gravel, and stone), and refined petroleum products are produced, but available information is inadequate to make a reliable estimate of output.

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TABLE 2
PAPUA NEW GUINEA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity[e]
Cement	thousand metric tons	Papua New Guinea-Halla Cement Pty. Ltd. (Halla Cement Corp., 50%, and Government, 50%)	Lae, Morobe Province	200
Copper	do.	Ok Tedi Mining Ltd., operator (National Papua New Guinea Sustainable Development Program Ltd., 70%, and Government, 30%)	Ok Tedi open cut, Western Province, 20 km northwest of Tabubil and 390 km southwest of Wewak	170
Gold	thousand kilograms	Newcrest Mining Ltd., operator, 100%	Lihir open cut, Lihir Island, New Ireland Province, 700 km northeast of Port Moresby	26
Do.		Allied Gold Mining plc, 100%	Simberi Island open cut, New Ireland Province	3
Do.		Newcrest Mining Ltd., 50%, and Harmony Gold Mining Co. Ltd., 50%	Hidden Valley open cut, Morobe Province, 90 km southwest of Lae	8
Do.		Ok Tedi Mining Ltd. (Papua New Guinea Sustainable Development Program Ltd., 70%, and Government, 30%)	Ok Tedi open cut, Western Province, 20 km northwest of Tabubil and 390 km southwest of Wewak	17
Do.		Porgera Joint Venture (Barrick Gold Corp., 95%, and Mineral Resources Development Corp., 5%)	Porgera open cut and underground mines, Enga Province, 620 km northwest of Port Moresby	22
Do.		New Guinea Gold Corp. (New Guinea Gold Corp., 92%)	Sinivit open pit, East New Britain Province, about 50 km south southwest of Rabaul	1
Petroleum:				
Crude	thousand 42-gallon barrels per day	Petroleum development license 2: Chevron Niugini Ltd. (operator and manager), 19.37%; Oil Search (Kutubu) Ltd., 27.14%; Orogen Minerals Ltd., 25.44%; Exxon Mobil Corp., 14.52%; Petroleum Resources (Kutubu) Ltd., 6.75%; Merlin Petroleum Co., 6.78% Petroleum development license 5: Exxon Mobil Corp. (operator and manager), 47.5%, and Oil Search Ltd., 52.5%	Central Moran oilfield, Southern Highlands Province (includes Agogo and Iaqufi-Hedinia fields). Onshore Papuan Basin, petroleum development licenses 2 and 5	20
Do.	do.	Chevron Niugini Ltd. (operator and manager), 19.37%; Oil Search Ltd., 27.14%; Orogen Minerals Ltd., 30.19%; Exxon Mobil Corp., 14.52%; Merlin Petroleum Co., 6.78%; Petroleum Resources Ltd. (Gobe), 2.0%	Gobe Main oilfield, Southern Highlands Province. Onshore Papuan Basin, petroleum development license 4	11
Do.	do.	Chevron Niugini Ltd. (operator and manager), 19.37%; Oil Search Ltd., 27.14%; Orogen Minerals Ltd., 25.44%; Exxon Mobil Corp., 14.52%; Petroleum Resources (Kutubu) Ltd., 6.75%; Merlin Petroleum Co., 6.78%	Kutubu oilfield, Southern Highlands Province. Onshore Papuan Basin, petroleum development license 2	16
Do.	do.	Santos Ltd. (operator and manager), 15.5%; Southern Highlands Petroleum Ltd., 39.14%; Orogen Minerals Ltd., 20.5%; Oil Search Ltd., 15.50%; Cue PNG Oil Co. Ltd., 5.42%; Petroleum Resources (Gobe) Ltd., 2.0%; Mountains West Exploration, Inc., 1.94%	South East Gobe oilfield, Gulf and Southern Highlands Provinces. Onshore Papuan Basin, petroleum development licenses 3 and 4	11
Refinery products	do.	InterOil Corp.	Port Moresby	33
Silver	thousand kilograms	Newcrest Mining Ltd., 50%, and Harmony Gold Mining Co. Ltd., 50%	Hidden Valley open cut, Morobe Province, 90 km southwest of Lae	124
Do.	do.	Ok Tedi Mining Ltd. (operator) (National Papua New Guinea Sustainable Development Program Ltd., 70%, and Government, 30%)	Ok Tedi open cut, Western Province, 20 km northwest of Tabulio and 390 km southwest of Wewak	30
Do.	do.	Porgera Joint Venture (Barrick Gold Corp., 95%, and Mineral Resources Development Corp., 5%)	Porgera open cut and underground mines, Enga Province, 620 km northwest of Port Moresby	4

[e]Estimated. Do., do. Ditto.
[1]Abbreviations used for units of measure in this table include the following: km, kilometer.

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THE MINERAL INDUSTRY OF THE PHILIPPINES

By Yolanda Fong-Sam

In 2011, one of the main mineral commodities produced in the Philippines was nickel. The country also produced other mineral commodities, such as cement, chromium, copper, gold, marine salt, and silver (table 1).

Minerals in the National Economy

In 2011, the mining and quarrying sector (at constant 2000 prices) contributed about 1.19% to the Philippines' gross domestic product (GDP) compared with 1.16% in 2010. The construction sector contributed 5.1% to the GDP compared with 5.7% in 2010 (Bangko Sentral ng Pilipinas, 2012).

In 2010, (the latest year for which data were available), the gross value of mineral production (including metallic and nonmetallic mineral commodities) was $3.2 billion.[1] In 2011, the gross value of the output of metals increased by 14% to $2.83 billion (2.07% of the GDP) from $2.48 billion in 2010. The value of gold produced in 2011 alone amounted to $1.46 billion (1.07% of the GDP) (Mines and Geosciences Bureau, 2012c).

Government Policies and Programs

The 1995 Philippine Mining Act regulates mineral resource development, requires the Government to monitor mining data (production, trade, and value) and maintain a database of mineral reserves, and encourages direct investment by the private and public sectors in mineral exploration and development activities in the Philippines. The Government grants exploration permits to qualified applicants to explore for mineral resources; exploration permits are valid for a period of 2 years and are renewable for not more than 4 years for exploration of nonmetallic minerals and 6 years for exploration of metallic minerals (Mines and Geosciences Bureau, 2010).

The 1995 Philippine Mining Act allows for three types of mining agreements. The first is a mineral agreement in which the Government grants a domestic contractor (a Filipino individual or corporation) an exclusive right to conduct mining operations in the contracted area. The agreement is valid for 25 years and is renewable for an additional 25 years. The second type of mining agreement is a Financial or Technical Assistance Agreement (FTAA), which is available to domestic and foreign corporations for a maximum area of 81,000 hectares (ha) onshore or 324,000 ha offshore; this agreement is valid for a period of 25 years and is renewable for another 25-year period. The third type of agreement is a mineral production-sharing agreement for properties with a maximum area of 16,200 ha; this permit, which is open to domestic and foreign corporations, is valid for a period of 25 years and is renewable for another 25-year period (Mines and Geosciences Bureau, 2012d).

In January, the Department of Environmental and Natural Resources of the Philippines (DENR) ordered its regional offices of the Mines and Geosciences Bureau (MGB) to suspend acceptance and processing of all types of new mining applications, including exploration permits, mineral-production-sharing agreements, financial and technical assistance agreements, and industrial sand and gravel permits. Based on Memorandum Order 2011–01, the measure is intended to ensure that older mining applications are processed and successfully implemented before new ones are considered. The measure also enables the identification of inactive mining projects. At the time of the memorandum's release, the DENR had identified more than 2,000 applications that were awaiting approval. The Department had been firm in taking final action against exploration contracts that had been expired for more than 5 years and with contracts that had not complied with the 3-year work program requirement for 2 consecutive years. These initiatives were part of the Department's effort to reform the mining sector, implement a use-or-lose policy for mining applications that are not compliant with the Government's mining regulations, and reduce the number of properties in an inactive status. In 2011, more than 900 inactive mining permits were cancelled or revoked to make way for new prospective mining applications (Department of Environmental and Natural Resources, 2011; Office of the President of the Philippines, 2011; Olchondra, 2011a).

Also in January, the Province of Romblon, which is an island Province located in the Mimaropa region, imposed a moratorium on all mining activities in the Province (including exploration, excavation, and extraction of metallic minerals), citing environmental concerns. The Provincial government was concerned about the effects of mine tailings contamination on farm lands and water systems. The ruling echoed the environmental code passed in June 2010 by South Cotabato Province (located in the Soccsksargen region in Mindanao), which banned the use of open pit mining as a method to extract mineral resources in the Province because of the potential for adverse environmental, food security, and health effects. The ban in South Cotabato Province was likely to affect mostly the Tampakan copper and gold mining project. The project, which was valued at $5.2 billion, was proposed to be commissioned in 2016 and would use an open pit mining method (Yahoo News, 2011).

In March 2011, the regional office of the MGB in central Mindanao Island proposed through its development council committee the creation of two new offices to help strengthen the mineral industry in the region. The two offices would function as mineral industry development bodies within the MGB in central Mindanao. One office would standardize mining policy and promote responsible mining across the region; the other office would gather the regional mineral industry stakeholders to enhance cooperation among industry leaders.

[1]Where necessary, values have been converted from Philippine pesos (PHP) to U.S. dollars (US$) at the rate of PHP43.31=US$1.00 for 2011 and PHP45.11=US$1.00 for 2010.

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The former Regional Minerals Development Council, which had a function similar to the one proposed for the standardization of policy office, was abolished in December 2010 by the previous Government administration when the agency to which it belonged was abolished. Unlike the former Regional Minerals Development Council, the new office will focus on the harmonization of mining policies and on promoting responsible mining in the region (Business World Philippines, 2011).

Production

In 2011, the Philippines Department of Energy reported a 3.5% increase in the production of coal to 6,881,000 metric tons (t) from 6,650,000 t in 2010. The coal was used mainly by the Philippine cement industry and for the generation of power domestically. According to the Department of Energy of the Philippines's energy plan for 2009 to 2030, the country was expecting to produce about 9 million metric tons (Mt) of coal by 2015 (table 1; Intellasia.net, 2010).

In 2011, the Philippines produced 241,000 t of nickel, which was an increase of 18% compared with that of 2010. Production of metals also increased significantly for zinc (96%) and chromite (72%) compared with that of 2010. Production also increased for all industrial minerals, including clay, dimension stone, and feldspar. The metallic mineral commodities for which production decreased in 2011 included manganese (61%), and gold (24%) (table 1).

Structure of the Mineral Industry

In 2011, an estimated 210,000 people, or 0.6% of the total employment in the country, were employed in the mining and quarrying industry (Mines and Geosciences Bureau, 2012a). Some of the main producers of mineral commodities in the Philippines were CGA Mining Ltd. of Australia (gold and silver); Lafayette Mining Ltd. of Australia (copper, gold, and silver); Lepanto Consolidated Mining Co. of the Philippines (copper, gold, and silver); Nickel Asia Corp. of the Philippines (nickel); Philex Mining Corp. of Canada (copper, gold, and silver); and TVI Resources Development Philippine Inc. (gold and silver), which was the Philippines affiliate of TVI Pacific Inc. of Canada. The country's major mineral industry facilities are listed in table 2.

Mineral Trade

In 2011, total trade in the Philippines increased modestly by 1.6% to $108.186 billion from $106.430 billion in 2010. The country's total exports were valued at $48.042 billion compared with $51.498 billion in 2010, which was a decrease of 6.7%; however, the total value of imports in 2011 increased by 9.5% to $60.144 billion from $54.933 billion in 2010. In 2011, the Philippines' total mineral exports were valued at $2.836 billion, which was about 6% of the country's total exports. In terms of minerals, the Philippines exported mainly copper, gold, and nickel, and these exports went mainly to Australia, Canada, China, and Japan. In 2011, imports of iron and steel and mineral fuels and related materials (including coal, coke, and crude petroleum) were valued at $13.81 billion (about 23% of the country's total import value) compared with $10.82 billion in 2010, which was an increase of about 28%. Imports of nonferrous metals increased in 2011 by 45% to $904.8 million from $625.9 million in 2010; however, imports of metal ores and metal scrap decreased in 2011 by 42.4% to $713.8 million from $1,238.6 million in 2010 (National Statistical Coordination Board, 2011; Republic of the Philippines National Statistics Office, 2012a, b).

Commodity Review

Metals

Copper, Gold, Silver, and Zinc.—In 2011, the mined copper production in the country totaled 63,835 t of metal content, which was an increase of 9.3% compared with the 58,412 t produced in 2010. Copper mine output at the Carmen Copper Corp.'s Toledo Copper Complex was 32,206 t compared with 27,241 t in 2010 (an increase of 18%); at Rapu-Rapu Processing Inc's polymetallic project, production reached 6,810 t compared with 5,972 t in 2010 (an increase of 14%); and at Philex Mining Corp.'s Padcal copper project, production increased by 6.6% to 17,216 t in 2011 from 16,157 t in 2010. Copper production decreased by 16% at TVI Resources' Canatuan mining project, however (Mines and Geosciences Bureau, 2012b).

Gold production decreased by 23.8% to 31,120 kg in 2011 from 40,847 kg in 2010 (table 1). Based on gold purchases by the Bangko Sentral ng Pilipinas (Philippines Central Bank), small-scale mines produced 17,389 kg of gold in 2011 compared with 25,232 kg of gold in 2010, which was a decrease of 31%. Significant decreases in production were reported at the Banahaw gold project, where gold production dropped by 31% to 2,219 kg in 2011 from 3,225 kg in 2010; at the Masbate gold project, where production decreased by 24% to 4,197 kg from 5,536 kg; and at the Victoria gold project, where production decreased by 21% to 564 kg from 712 kg. Some gold production increases were reported in polymetallic projects that produced gold as a byproduct, however; for example at the Toledo Copper Complex, where production increased by 15.8% to 213 kg of gold in 2011 from 184 kg in 2010 (Mines and Geosciences Bureau, 2012b).

In April, TVI Resources submitted an application to the MGB for a declaration of mining feasibility for its Balabag gold and silver project, which included a report on the economics of mining the property and the capital cost of such activity. The property covers a 52-square-kilometer (km^2) area and is located in Zamboanga del Norte Province in Mindanao. While the company was awaiting Government approval of the mining feasibility application, the company continued with its scheduled activities, which included sample drilling, a ground penetration study, and an environmental impact assessment, among other activities (TVI Pacific Inc., 2012a).

In May, Philex announced that it had reached an agreement with First Metro Investment Corp. of the Philippines and the Bank of the Philippine Islands to acquire 5% of the shares from the Lepanto Consolidated Mining Corp. Lepanto had a 40% interest in the Far Southeast Gold project, which is located in the municipality of Mankayan, Benguet Province, Luzon Island. The Far Southeast Gold ore body is a gold-rich porphyry copper deposit (Thomson Reuters, 2011a).

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Also in May, the Provincial Board of Batangas Province backed the decision of Crazy Horse Resources Inc. of Canada to develop the Taysan Copper Gold Project. In Resolution No. 253, the Government expressed its support to Crazy Horse's proposed approach to develop the property, including its selected open pit mining method. Also in May, the company entered into an agreement with a private local company to acquire approximately 16 ha in the port facility of Batangas. The Taysan project, which comprises a total area of 11,254 ha, is located in Batangas Province, Luzon Island, about 100 kilometers (km) south of Manila and 20 km east of Batangas City, which is the Provincial capital. The proposed Taysan project consists of two exploration permits and three exploration permit applications, all originally obtained by Taysan Copper Corp (TCC). In November 2010, Crazy Horse acquired 100% interest in the Taysan project through its wholly owned subsidiary Asia Arc Mining Resources Inc. By the end of 2011, the company reported its estimated measured and indicated resources for the project to be 459 Mt grading 0.26% copper, 0.10 grams per metric ton (g/t) gold, 0.8 g/t silver, and 3.3% magnetite. The project had an estimated cost of $521 million and an expected mine life of 24 years (Crazy Horse Resources Inc., 2011, p. 12, 15, 26, 32, 35; 2012a, b).

In May, Philex announced that it had finalized an exploration and joint-development agreement with Manila Mining Corp. (MMC) for the Kalayaan project, which is located in Surigao del Norte, Mindanao. The project had an exploration permit under the name Kalayaan Copper Gold Resources Inc., which was a wholly owned subsidiary of MMC. In the transaction, Philex acquired 5% interest in the Kalayaan project, with the option to obtain an additional 55% by funding approximately $25 million for all predevelopment expenses and a feasibility study for the project. Under the agreement, Philex and MMC would jointly participate in the development phase of the project. The Kalayaan project covers an area of 286 ha and is located directly north of Philex's primary project in the area, the Silangan project, which hosts the Bayugo and Boyongan deposits. Drilling work started in the Kalayaan project in December 2011 (Manila Bulletin, 2011; Thomson Reuters, 2011b; Philex Mining Corp., 2012). In October, Philex announced that under the right economic conditions and higher metal prices, the company could extend the mine life of the Silangan gold-copper-silver project for up to 50 years. The company planned to reach the goal by mining lower grade ore from its Bayugo and Boyongan deposits, although no specifics were offered regarding the grade at which it would be mined. The Bayugo and Boyongan deposits had a measured and indicated resource of more than 4 Mt of copper (reported as 9 billion pounds) at a cutoff grade of 0.5% copper equivalent and about 156,000 kg of gold (reported as 5 million troy ounces). The cutoff grade was based on a copper price of $2.75 per pound and a gold price of $900 per troy ounce. The cost to develop this project was estimated to be about $1 billion during a period of 3 years. The project was expected to be commissioned in 2017 (Olchondra, 2011b).

In June, Indophil Resources NL of Australia announced that it had submitted an application to the Government requesting an environmental compliance certificate for the Tampakan copper-gold mining project. As part of the permit application process, in December 2011, the company submitted the final mine environmental impact assessment to be evaluated as part of the environmental certificate package. This application followed the submission of the feasibility study of the project, which was submitted to the Government in April 2010, and was still pending approval as of the end of 2011. The feasibility study indicated the potential for the project to produce an average of 450,000 t/yr of copper during its first 5 years of production, and an average of 375,000 t/yr of copper and about 11,200 kilograms per year (kg/yr) of gold (reported as 360,000 troy ounces per year) for a minimum of 17 years. The Tampakan site covered an area of 10,000 ha and was operated by Sagittarius Mines, Inc. (SMI). The project, which was owned by Xstrata plc of the United Kingdom (62.5%) and Indophil (37.5%), is located in South Cotabato Province near the town of Tampakan on the southern island of Mindanao. By the end of 2011, Xstrata completed a mineral resource reestimation, which resulted in an increase of the mineral resources at Tampakan to 2.94 billion metric tons of ore at grades of 0.51% copper and 0.19 g/t gold at a cutoff grade of 0.2% copper, which represented 15 Mt of copper and 547,000 kg of gold (reported as 17.6 million troy ounces). The project, which was planned as an open pit mining operation to be commissioned by 2016, was under an FTAA for a term of 25 years. In early January 2012, the Philippines Environmental Management Bureau denied Tampakan's permit application under the condition that it would be reevaluated once an environmental code dispute banning all open pit mining in the Province had been resolved. The environmental code measure was passed by South Cotabato Province in June 2010 and consisted of a Provincial ordinance that banned the use of open pit mining as a method to extract resources (Indophil Resources NL, 2012a, b; Sagittarius Mines, Inc., 2012).

In June, Oceana Gold Corp. of Australia (92%) announced that it had begun construction of its Didipio gold-copper project, which is located to the north of the island of Luzon in northern Philippines, approximately 270 km north of the capital city of Manila. The commissioning of the project was expected in the fourth quarter of 2012, and production was planned to start by the end of 2012. The project was under an FTAA for an area of about 158 km² and had an estimated mine life of 16 years as an open pit mining operation, and approximately 8 additional years as an underground operation. Once in operation, the company forecasted annual production of more than 3,100 kg of gold (reported as 100,000 troy ounces), and 14,000 t of copper in concentrate. The measured and indicated resources for the Didipio project were approximately 66,600 kg of gold (reported as 2.14 million troy ounces), and 290,000 t of copper; reserves were estimated to be about 52,300 kg of gold (reported as 1.68 million troy ounces) and 230,000 t of copper. After the commissioning of Didipio, the company planned to conduct a feasibility study to increase the plant's capacity from 3.5 million metric tons per year (Mt/yr) to 5 Mt/yr, which was expected to increase production to about 4,700 kg/yr of gold (reported as 150,000 troy ounces per year) and 20,000 t/yr of copper (OceanaGold Corp., 2012a, b).

In July 2011, TVI Resources announced that it had completed the first zinc concentrate shipment in its Canatuan copper and zinc mining project. By the end the year, the project reported a

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total production for the year of 3,694 t of zinc. The Canatuan mining project is a polymetallic mine located in the Zamboanga del Norte Province in Mindanao. The company completed an expansion project in April 2010 that consisted of the construction of a zinc circuit to produce zinc concentrate. During 2011, an additional zinc flotation device was added to increase the capacity and production of copper and zinc concentrates (Mines and Geosciences Bureau, 2012b; TVI Pacific Inc., 2012b).

In October, FCF Minerals Corp. (a local subsidiary of Metals Exploration plc of the United Kingdom) announced that the DENR had approved its request for a declaration of the mining project feasibility of its Runruno polymetallic project. The approval of this permit allowed the company to start the design, development, and construction phase of the project, which was to include the construction of a processing plant and other infrastructure. The Runruno copper, gold, and molybdenum project, which is located in Nueva Vizcaya Province about 322 km north of Manila, was planned as an open pit mining operation at an estimated cost about $168 million. The company was expecting to start the construction of the processing plant in the latter half of 2012 and to have it commissioned and producing by the end of 2013. The company had identified areas with gold and molybdenum mineralization within the Runruno project area as well as zones with gold and copper anomalies. As of March 2011, the Runruno resources were estimated to be 43,200 kg of gold (reported as 1.39 million tròy ounces) and 11,600 t of molybdenum (reported as 25.6 million pounds); total ore resources were estimated to be 25.7 Mt at grades of 1.69 g/t gold and 470 parts per million molybdenum (Metals Exploration plc., 2012a, b).

Nickel.—In 2011, the production of nickel increased by 18% to 241,000 t from 204,000 t (revised) in 2010 (table 1). In April, Nickel Asia Corp. of the Philippines and Sumitomo Metal Mining Co. Ltd. of Japan announced that they had agreed to jointly invest $1.4 billion in the construction of a second nickel plant to be located near Nickel Asia's Taganito nickel mining operations in Surigao del Norte. The new plant was under construction during 2011 and was to use high-pressure acid-leach technology to process limonite or low-grade nickel ore. The plant was expected to be in production by 2013. Nickel Asia would hold a 22.5% stake in the project, and Sumitomo would hold a 55% stake (Stainless Steel World, 2011).

In May, Nickel Asia finalized a shareholder's agreement with Sumitomo that endorsed the latter's participation in Nickel Asia's gold exploration subsidiary Cordillera Exploration Co. Inc. (Cexci). By November, Sumitomo had acquired a 25% interest in Cexci's equity shares after investing $1.8 million. Sumitomo had the option to acquire an additional 15% interest by investing another $2.8 million, for a total of 40% equity interest. Nickel Asia's main goal for the agreement was to fund exploration activities on Cexci's four gold and copper properties located in the Cordillera Central in northern Luzon. Cexci's original exploration permit (granted in 2006) had expired, and the company had applied for a renewal in 2009. As a condition for the permit renewal and in accordance with the country's Mining Law, Cexci was required to surrender 40% of its original property acreage. Renewal of the exploration permit was granted in November 2011 (Gao, 2011; Nickel Asia Corp., 2011).

In October, the British company ENK plc produced its first 50 kilograms (kg) of nickel hydroxide during the trial phase of the pilot plant at its Acoje nickel project on Luzon Island. The company expected to produce about 2.4 metric tons per year (t/yr) of the nickel hydroxide. Production was expected to commence formally in mid-2013. The Acoje project covers an area of 3,765 ha and had estimated inferred and indicated resources of 50.14 Mt at grades of 1.08% nickel and 0.05% cobalt (Australia's Paydirt, 2011; ENK plc, 2012).

Industrial Minerals

Cement.—In early 2011, Eagle Cement Co. started commercial production. The company, which was based in Akle, San Ildefonso, Bulacan, was a manufacturer and distributor of cement. The company served the areas of Manila and the Provinces of Nueva Ecija and Nueva Vizcaya. Eagle Cement plant had the capacity to produce 1.5 Mt/yr of cement (Maxwell-Cook, 2011).

Outlook

Beginning in 2012, foreign direct investment in the Philippines could be affected by the DENR mandate that acceptance and processing of all types of new mining applications be suspended effective January 2011. The measure, which was designed to ensure the processing of older applications and identify inactive mining projects, could discourage investors, as the waiting time for the approval of new applications could be delayed indefinitely. On the other hand, the measure could also revitalize the mining industry by having inactive mining projects become available to new prospectors.

In April, the DENR forecasted that total mining investment in the Philippines would reach $18 billion by the year 2016. The DENR estimated that the cumulative mining investment in the country from 2004 to 2011 was $4.453 billion; 2004 was the year that the Philippines Supreme Court approved a measure that allowed foreign investors to have full ownership of large-scale mining projects in the country. By 2016, the country expects several mining investment projects that started in 2010 and 2011 to be commissioned; among them are the Tampakan copper-gold project (estimated to cost more than $5 billion); the Kingking copper and gold project developed by St. Augustine Gold and Copper Ltd. of the United States, and CGA Mining Ltd. of Australia ($1.8 billion); and a hydrometallurgical nickel processing plant by Nickel Asia and Sumitomo ($1.4 billion), among other projects (Olchondra, 2011a; Mines and Geosciences Bureau, 2012c).

The industrial minerals and construction materials sector in the country had a steady increase in production during 2011, which benefited from the demand in the Southeast Asia region. The Philippines is likely to be a key supplier and producer of these mineral commodities, as well as a significant producer of such metals as chromium, nickel, and zinc. The production of metallic minerals will continue to be important to the Philippine economy, as many established projects have started to expand their facilities and production capacities. Similarly, the production of copper, gold, and nickel is expected to increase as major exploration activities result in new discoveries

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and increases in resources and as proposed developments are commissioned in the near future, such as the Didipio gold-copper project (2012); Nickel Asia's second nickel plant in the country (2013); the Runruno polymetallic project (2013); the Tampakan copper-gold project (2016); and the Silangan gold-copper-silver project (2017).

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TABLE 1
PHILIPPINES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2007	2008	2009	2010	2011
METALS						
Chromium, chromite, gross weight		31,592	15,268	14,322	14,807	25,483
Cobalt, mine output, Co content[3]		1,000	1,200 e	1,500 e	2,200	2,200 e
Copper:						
Mine output, Cu content		22,862	21,235	49,060	58,412	63,835
Metal:						
Smelter		220,000	239,700	230,100	216,200	205,000
Refined		160,200	174,600	178,000	171,900	164,000
Gold, mine output, Au content	kilograms	38,792	35,726	37,047	40,847	31,120
Iron and steel, steel, crude	thousand metric tons	718	711	824	1,050 r	1,200
Lead, metal, secondary refined		34,000	34,000	32,000 r	30,000 r	34,000
Manganese, Mn content (43%)		2,200	5,500	3,600	4,900	1,900
Nickel, mine output, Ni content[4, 5]		136,000	75,000	144,000	204,000	241,000
Silver, mine output, Ag content	kilograms	27,754	14,224	33,808	41,004	45,530
Zinc, mine output, Zn content		7,394	1,619	10,035	9,268	18,170
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	13,048	13,369	14,865	15,900	16,063
Clays:						
Bentonite		1,148	1,422	1,413	1,475	2,087
Red		6,742	7,181	7,357	7,050	8,243
White		7,224	8,745	8,519	8,857	12,246
Other		4,883	5,601	5,599	5,878	8,143
Feldspar		14,837	15,838	16,394	15,882	22,050
Lime		3,822	4,299	4,327	4,524	5,934
Perlite		4,515	4,593	4,606	4,756	6,272
Phosphate rock		1,961	2,271	2,257	2,308	2,778
Salt, marine		437,689	510,059	516,066	557,644	720,146
Sand and gravel:						
Silica sand	thousand metric tons	221	270	284	296	352
Other[6]	thousand cubic meters	40,076	46,659	46,602	49,009	58,815
Stone:						
Crushed, broken, other[7]	do.	2,810	3,077	3,069	3,258	4,259
Dolomite		1,092,748	1,150,035	1,176,991	1,259,152	1,431,118
Limestone[8]	thousand metric tons	26,419	31,528	33,090	35,540	42,526
Marble, dimension, unfinished	cubic meters	4,791	5,410	5,629	6,001	8,043
Pumice		1,912	2,063	2,064	2,274	2,797
Quartz e		50,000	50,000	50,000	50,000	50,000
Tuff		16,490	17,570	18,830	19,166	22,106
Volcanic cinder[9]	cubic meters	6,177	6,519	6,686	7,325	9,219
Sulfur, all forms e		180,000	180,000	180,000	180,000	180,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades	thousand metric tons	3,401	3,610	4,687	6,650	6,881
Gas, natural, gross	million cubic meters	3,687	3,881	3,909	3,681	3,975
Petroleum:						
Crude	thousand 42-gallon barrels	184	965	2,920	3,059	2,326
Refinery products: e						
Liquefied petroleum gas	do.	2,951 [10]	3,556 [10]	3,286 [10]	3,500	3,500
Gasoline	do.	12,491 [10]	11,988 [10]	9,153 [10]	9,000	9,000
Jet fuel	do.	46,000	46,000	46,000	46,000	46,000
Kerosene	do.	7,277 [10]	6,596 [10]	1,002 [10]	1,000	1,000
Distillate fuel oil	do.	170,000	23,871 [10]	17,541 [10]	17,500	17,500
Residual fuel oil	do.	21,226 [10]	15,975 [10]	10,776 [10]	10,000	10,000
Refinery fuel and losses	do.	230,000	2,307 [10]	2,068 [10]	2,000	2,000
Other	do.	1,725 [10]	2,882 [10]	4,635 [10]	4,500	4,500
Total	do.	492,000	113,000	94,500	93,500	93,500

See footnotes at end of table.

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TABLE 1—Continued
PHILIPPINES: PRODUCTION OF MINERAL COMMODITIES[1]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto.
[1]Table includes data available through December 6, 2012.
[2]In addition to the commodities listed, the Philippines produce platinum-group metals as byproducts of other metal production, but available information is inadequate to make reliable estimates of output.
[3]The majority of the nickel laterite produced in the Philippines is exported to China, but whether cobalt content is recovered is not known.
[4]Nickel, mine output, Ni content production, in metric tons, reported by the Government was 2007—91,367; 2008—80,644; 2009—139,744; 2010—184,330 (revised); and 2011—319,354.
[5]Data compiled using trade data from the United Nations Comtrade database for nickel ores and concentrates imported from the Philippines by China and Japan.
[6]Includes "pebbles" and "soil" not further described.
[7]Includes materials described as rock, crushed or broken/blasted; stones, cobbles, and boulders; pebbles; rock aggregates; and broken adobe.
[8]Includes limestone for agriculture, cement manufacturing, industrial use, and other.
[9]Reported as "black cinder" for years 2007 to 2011 by the Philippines Mines and Geosciences Bureau.
[10]Reported figure.

TABLE 2
PHILIPPINES: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Eagle Cement Co.	Plant located in Akle, San Ildefonso, Bulacan	1,500,000.
Do.	Fortune Cement Corp.	Bulacan plant at Norzagaray, Bulacan Province; Batangas plant at Taysan, Batangas Province	2,100,000.
Do.	Holcim Philippines, Inc.	Bulacan plant at Norzagaray, Bulacan Province; Davao plant at Barrio Ilang, Davao City; La Union plant at Bacnotan, La Union Province; Lugait plant at Lugait, Misamis Oriental Province	7,200,000.
Do.	Solid Cement Corp., APO Cement Corp., and Rizal Cement Corp.	Cement plants at three locations— Naga, Cebu Province (APO Cement Corp.); Antipolo City, Rizal Province (Solid Cement Corp.); Binangonan, Rizal Province (Rizal Cement Corp.)	4,300,000.
Chromite	Consolidated Mines Inc. (owner) and Benguet Corp. (operator)	Masinloc chromite mine (Coto chromite deposit) in Coto, 27 kilometers east of the Port of Mansiloc in Zambales Province	5,000.
Do.	Heritage Resources Mining Corp.	Homonhon chromite project	17,000.
Do.	Krominco Inc.	Dinagat chromite project—Redondo Mine (Mt. Redondo deposit) in the Municipality of Loreto, Dinagat Island	26,000.
Copper, concentrate	Carmen Copper Corp.	Toledo Copper Complex, in the Central Highlands of Cebu, Cebu Island	20,000.
Do.	Lafayette Mining Ltd., 75%, and LG International and Korean Resources Corp., 25%	Rapu-Rapu Mine under the Rapu-Rapu polymetallic project in Albay Province	36,000.
Do.	Lepanto Consolidated Mining Co.	Victoria and Teresa Mines in Mankayan, Benguet Province	200.
Do.	Philex Mining Corp. (through its subsidiary Philex Gold Inc.), 81%	Padcal copper project in Tuba, Benguet Province, Luzon Island	21,000.
Do.	TVI Resources Development Philippine Inc., 100%	Canatuan project, located east of Siocon, Province of Zamboanga del Norte, Mindanao Island	10,000.
Do.	Glencore International plc.	Philippine Associated Smelting and Refining Corp. (PASAR) in Isabel, Leyte Province	250,000 smelter; 173,000 refinery.

See footnotes at end of table.

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TABLE 2—Continued
PHILIPPINES: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold, mine kilograms	APEX Mining Company Inc.	APEX Maco operation	100.
Do. do.	CGA Mining Ltd.	Masbate Gold Project, 350 kilometers south of Manila, Masbate Island	6,000.
Do. do.	Lafayette Mining Ltd., 75%, and LG International and Korean Resources Corp., 25%	Rapu-Rapu Mine under the Rapu-Rapu polymetallic project in Albay Province	1,500.
Do.	Lepanto Consolidated Mining Co.	Victoria and Teresa Mines in Mankayan, Benguet Province	2,000.
Do. do.	Philex Mining Corp. (through its subsidiary Philex Gold Inc.), 81%	Padcal Mine (Sto. Tomas II deposit) in Tuba, Benguet Province, Luzon Island	5,000.
Do. do.	Philippine Mining Development Corp.	Diwalwal Direct State Development Project at Mount Diwalwal in Davao del Norte Province	100.
Do. do.	Philsaga Mining Corp.	Banahaw Gold Project	NA.
Do. do.	TVI Resources Development Philippine Inc., 100%	Canatuan project, located east of Siocon, Province of Zamboanga del Norte, Mindanao Island	500.
Nickel, mine	CRAU Mineral Resources Corp.	Santa Cruz-Candelaria Nickel project located in Zambales Province	1,000.
Do.	CTP Construction & Mining Corp.	Adlay-Cagdianao-Tandawa (ACT) nickel project in Barangay Adlay, Municipality of Carrascal, Province of Surigao del Sur	10,000.
Do.	Hinatuan Mining Corp.	South Dinagat project on Nonoc Island	4,000.
Do.	Nickel Asia Corp., 100%	Cagdianao nickel project near Barangay Valencia on Dinagat Island	10,000.
Do.	do.	Tagana-an nickel project on Hinatuan Island	30,000.
Do.	Nickel Asia Corp., 65%; Pacific Metals Co. Ltd., 33.5%; Sojitz Philippines, 1.5%	Claver nickel project (Taganito) in Surigao del Norte Province, Mindanao Island	16,000.
Do.	Nickel Asia Corp., 60%; Pacific Metals Co. Ltd., 36%; Sojitz Philippines, 4%	Rio Tuba nickel project in Barrio Rio Tuba, Municipality of Bataraza, Palawan Province.	5,000.
Do.	SR Metals, Inc.	SR Nickel project, Tubay Mine in Tubay, Agusan del Norte Province	25,000.
Do.	Toledo Mining Corporation Plc., 56.1%	Berong nickel project on Palawan Island	10,000.
Nickel, mine and plant	Coral Bay Nickel Corp. (Sumitomo Metal Mining Co. Ltd., 54%; Mitsui & Co. Ltd. 18%; Rio Tuba Nickel Mining Corp., 10%; Nickel Asia Corp., 6%)	Coral Bay nickel high pressure acid-leach (HPAL) plant on Palawan Island	24,000 nickel; 1,800 cobalt
Silver kilograms	Lafayette Mining Ltd., 75%, and LG International and Korean Resources Corp., 25%	Rapu-Rapu Mine under the Rapu-Rapu polymetallic project in Albay Province	18,000.
Do. do.	Lepanto Consolidated Mining Co.	Victoria and Teresa Mines in Mankayan, Benguet Province	4,000.
Do. do.	Philex Mining Corp. (through its subsidiary Philex Gold Inc.), 81%	Padcal Mine (Santo Tomas II deposit) in Tuba, Benguet Province, Luzon Island	5,000.
Do. do.	TVI Resources Development Philippine Inc., 100%	Canatuan project, located east of Siocon, Province of Zamboanga del Norte, Mindanao Island	17,000.
Zinc	Lafayette Mining Ltd., 75%, and LG International and Korean Resources Corp., 25%	Rapu-Rapu Mine under the Rapu-Rapu polymetallic project in Albay Province	8,000.

Do., do. Ditto. NA Not available.

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The Mineral Industry of Singapore

By Pui-Kwan Tse

Singapore is a city-state located in the Strait of Malacca in Southeast Asia. Singapore is one of the world's busiest ports and identifies itself as "the place where Asia and the West meet." The global financial crisis and the slowdown of industrial activities in the West hit the economy of the country hard in 2008 and 2009. The country's economy rebounded in 2010, however, and the gross domestic product (GDP) increased by 14.8% in 2010 and 4.9% in 2011.

Because it has limited mineral resources, Singapore must import most of the raw materials needed for manufacturing. The value of output in the manufacturing sector increased by 29.7% in 2010 and 7.6% in 2011. Overall investment increased by 5.1% in 2010 and 10% in 2011. The value of nonoil exports increased by 2.2% in 2011 after increasing by 23% in 2010 owing to the higher value of nonelectronic exports, which increased by 11% in 2011 following an increase of 21% in 2010. The higher value of nonelectronic products was the result of increased exports of engineering equipment, pharmaceutical products, and printed materials. Exports of electronic products decreased in volume by 13% in 2011 compared with that of 2010. Although electronics remained the leading trade commodity in Singapore, Singaporean total trade was valued at US$693 billion (S$902 billion) and US$773 billion (S$974 billion) in 2010 and 2011, respectively. Asian countries accounted for about 70% of the total trade (Department of Statistics, 2012, p. 41–48; Ministry of Trade and Industry, 2012).

The service sector accounted for 70% of total employment in the country. The unemployment rate was 2.0% after the Government tightened the foreign worker levies in 2011 (Department of Statistics, 2012, p. 41–48; Ministry of Trade and Industry, 2012).

Production

NatSteel Asia Pte Ltd. was the sole integrated steel melting, rolling, and fabricating producer in Singapore; it was owned by Tata Iron and Steel Co. of India. The company's plant in Singapore had a design output capacity of 720,000 metric tons per year (t/yr) of crude steel [from its 80-metric-ton (t) electric arc furnace and 80-t ladle furnace] and 720,000 t/yr of rolled steel. In 2010, NatSteel produced about 728,000 t of crude steel in Singapore. NatSteel's steel production capacity worldwide was more than 2 million metric tons per year owing to the acquisition in 2010 of steel plants in Indonesia, Thailand, and Vietnam. Singapore consumed about 2.7 million metric tons of steel in 2010 (South East Asia Iron and Steel Institute, 2011, p. 72).

Singapore was one of the major manufacturing and trading hubs for the international chemical sector. Chemical, petroleum, and petroleum products were Singapore's leading exports and reexports after electronics. The Government planned to increase the output share of petrochemical products in the manufacturing industry to 30% in 2010. Major multinational petrochemical companies, such as BASF Group, Chevron Corp., Exxon Mobil Corp., Mitsui Chemical Co., Royal Dutch/Shell Group, and Sumitomo Chemical Co., had set up plants on the island.

Outlook

Singapore recovered slowly after the global financial crisis in 2008 and 2009. The global demand for electronics, which was a major component of the country's export revenue, is expected to improve during the next several years. The domestic construction sector is likely to be the major source of demand for construction materials during the next 2 years. Several construction projects, including the expansion of a financial center and the development of new infrastructure, are in process. The demand for steel products is expected to increase during the next 2 to 3 years, and Singapore will continue to rely on steel imports to meet its domestic needs. Facing strong competition from neighboring countries, the Singaporean electronics companies have plans to restructure and seek higher value-added products. Biomedical manufacturing appears to have strong growth potential in Singapore.

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The Mineral Industry of Sri Lanka

By Chin S. Kuo

Sri Lanka has a variety of industrial minerals, which include ball clay, kaolin, and other clays; calcite; dolomite; feldspar; gemstones; graphite; limestone; mica; mineral sands; phosphate rock; quartz; and silica sand. The mineral industry produced cement, gemstones and jewelry, nonmetallic mineral products, and petroleum products. The country produced no metals or crude oil, and it imported petroleum for refining.

Sri Lanka's gross domestic product (GDP) was $59 billion in 2011, and the country's per capita income was $5,600 based on purchasing power parity. Following the end of the civil war in 2009, the country recorded strong GDP growth of 8.3% owing to reconstruction and infrastructure development. The industrial sector registered a growth of 9.6% and contributed 29.6% to the GDP. Mining and quarrying accounted for 2% of the GDP. Total exports increased by 31% in 2011, and gems and semiprecious stones were among the leading export mineral commodities. Total imports increased by 50%, and crude petroleum was a major import item (U.S. Central Intelligence Agency, 2011).

Production

In 2011, the value of Sri Lanka's gemstone production was estimated to have increased by 20% compared with the value in 2010 owing to the high prices of gemstones on the world market; the output of ruby and sapphire increased by 11.7% and 7.3%, respectively. Cement production and production of clays that were used to manufacture cement were estimated to have increased by 10% each. Feldspar production and kaolin production were estimated to have decreased by 7.2% and 2.5%, respectively. Based on the country's export data, production of rutile (a titanium mineral) decreased by 5.1%, and that of ilmenite increased by 1.2%. Production of zircon fluctuated during the past 5 years (table 1).

Structure of the Mineral Industry

The development of mineral resources is the responsibility of the Geological Survey and Mines Bureau and is governed by the Mines and Minerals Act No. 33 of 1992 and the Mining (Licensing) Regulations No. 1 of 1993. The mining of graphite, mineral sands, phosphate rock, and salt was performed by state-owned companies. A crude oil refinery was operated by state-owned Ceylon Petroleum Corp. The Government had no plans to privatize any state-owned enterprises but planned instead to retain ownership and management of these enterprises and to make them profitable. The private sector produced all other mineral output, with the exception of cement, which was manufactured and sold mostly by the private sector and foreign investors and by state-owned Sri Lanka Cement Corp. A German company owned an 87% stake in Bogala Graphite Lanka Ltd., and the Government owned the remaining 13% (table 2).

Commodity Review

Metals

Iron and Steel.—Ceylon Steel Corp. planned to commission its new steel bar mill at a cost of $80 million. The 3-year expansion project was completed at Oruwela, south of Colombo, during 2011. The mill's production capacity was expanded to 250,000 metric tons per year (t/yr) from 100,000 t/yr, and the mill was equipped with an online capability to conduct troubleshooting from its supplier Danieli Group of Italy. The plant used the quenching and self-tempering bar process to produce high-strength corrosion-resistant steel. The company also planned to diversify its product range from bars to galvanized wire, pipes, nails, and other steel products.

Premier Steel Mills (Pvt.) Ltd. and its subsidiaries operated steel mills and produced and marketed specialty and regular steel products to domestic customers. The company also exported and imported scrap metal in a global operation (Kovilagodage, 2011).

Titanium.—The black mineral sands of Pulmoddai beach, which is located 52 kilometers north of Trincomalee, have heavy mineral concentrates of 50% to 60% and were considered to be some of the world's richest mineral sand deposits. The resource of heavy minerals at Pulmoddai beach was estimated to be 12.5 million metric tons containing 65% ilmenite, 10% rutile, 10% zircon, and minor amounts of garnet and monazite.

Lanka Mineral Sands Corp.'s plant at Pulmoddai resumed production after being shut down owing to the conflict between the Government and the Tamil Tigers rebel group. The plant employed 600 workers and had the capacity to produce 90,000 t/yr of ilmenite, 9,000 t/yr of rutile, and 5,500 t/yr of zircon. Lanka Mineral Sands exported 93,500 metric tons (t) of mineral sands in 2010 (the latest year for which data were available), of which 64% went to China, 29% to India, and 7% to the United Arab Emirates (UAE). The company exported 20,000 t/yr of ilmenite (Gunasekera, 2011).

Lanka Mineral Sands was in the process of expanding its mineral sand operation. The proposed expansion would cover newly discovered deposits that extend from Pulmoddai north to Mullaitivu. Using a 10% cutoff grade, the company intended to mine these deposits and the immediate inland areas where mineral concentration was 10%. The Government planned to invest $500 million for a new plant and machinery, including new front-end loaders. The initial plan called for ilmenite production of between 100,000 and 125,000 t/yr. Lanka Mineral Sands had also expressed interest in entering into a joint venture with an international partner to make value-added products, such as titanium dioxide and synthetic rutile (Gunasekera, 2011).

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Industrial Minerals

Cement.—Sri Lanka, which faced a potential cement shortage owing to increased demand, imported cement from Indonesia, Malaysia, and Pakistan. In August, however, more than 5,000 t of imported cement was stuck in local ports owing to a lack of certificates from the Sri Lanka Standards Institute. Much of the cement from Pakistan was thought not to meet quality standards. Later, tests by independent foreign laboratories found that the imports did meet Sri Lanka's quality standards, and the ban placed on the imported cement from Pakistan was lifted (India Cement and Construction Materials Magazine, 2011b).

Sri Lanka's cement industry continued to draw investment from abroad. Holcim Ltd. of Switzerland planned to expand the grinding capacity of its cement plants and to construct a new cement plant of undetermined production capacity. Holcim (Lanka) Ltd., which was a subsidiary of Holcim, operated a 1-million-metric-ton-per-year (Mt/yr)-capacity integrated cement plant at Puttalam and a grinding plant at Galle. The company planned to build a new packing plant at Trincomalee. The company's cement terminal at Galle received imported cement. The company also produced special cement for large-scale infrastructure projects. It sold cement and services in nine regions of the country and provided approximately 15,000 direct and indirect employment opportunities [Holcim (Lanka) Ltd., 2011].

The Government decided to reactivate the Kankesanthurai cement plant after the region was determined to have substantial limestone deposits sufficient for 100 years at a production rate of 3,500 metric tons per day. The country was in a construction boom, and the Government planned to import between 10,000 and 15,000 metric tons per month of cement from Bharathi Cement of India to meet Sri Lanka's growing demand (India Cement and Construction Materials Magazine, 2011a).

Gemstones.—Sri Lanka's gemstone deposits contain a wide range of gemstones and semiprecious stones. The majority of the deposits are secondary alluvial gravels, and the dominant gem mineral is corundum in the form of geuda, rubies, and sapphires. The Highland Complex of Sri Lanka, which is a high-grade metamorphic terrain, is one of the most prominent gem-bearing terrains in the world. The gemstone deposits are mostly of Quaternary sedimentary type and are abundant in the granulitic terrains of the southwest and southeast, such as the Ratnapura District. Highly differentiated granites and pegmatites contain monazite, rutile, and zircon. State Gem Corp. mined the topaz deposits at Polwatta in central Sri Lanka (Gem Net Sri Lanka, 2011).

Graphite.—Sri Lanka's production of graphite was steady at about 3,500 t in 2011. The country's two major producers were Bogala Graphite Lanka plc and Kahatagaha Graphite Lanka Ltd., which had a combined production capacity of 11,000 t/yr. The lump graphite was of vein type. A small amount of graphite was used domestically, but the majority of the output was exported (Moores, 2011).

The Kahatagaha Mines are located at Maduragoda in Sri Lanka's Northwestern Province and managed by state-owned Kahatagaha Graphite Lanka Ltd. Nearly 95% of the run-of-mine ore was graphite that was more than 90% carbon and had a low ash content. The high-grade graphite was mined from the active level at 610 meters (m) below the surface. The deposit was a vein-type graphite occurrence in crystal form. The graphite products were exported to Australia, India, Japan, the Republic of Korea, Pakistan, and the United States. Sri Lanka was estimated to have graphite reserves of 180,000 t (Kahatagaha Graphite Lanka Ltd., 2011).

Phosphate Rock.—Sri Lanka sought a $60 million credit line from the Government of Japan to expand the production capacity of Lanka Phosphate Ltd.'s Eppawala plant. The plant produced 46,000 t/yr of phosphate rock, which was used for the manufacture of diammonium phosphate. The proposed credit line would help bring in new machinery and upgrade the technology of the plant. The company planned to produce a single superphosphate (News 360 Publishers Pvt. Ltd., 2011).

The Ministry of State Resources and Enterprise Development invited bids for the design, supply, delivery, installation, commissioning, and handing over of a new grinding mill for phosphate rock to Lanka Phosphate's Eppawala plant. Bids were due by September 9, 2011. The new grinding mill would help increase the company's output of phosphate rock (Ministry of State Resources and Enterprise Development, 2011).

Mineral Fuels

Natural Gas.—Cairn Lanka Ltd., which was a subsidiary of Cairn India Ltd., made a gas discovery in a well on one block in the Mannar Basin in Sri Lanka. The well encountered a 25-m hydrocarbon column in sandstone at a depth of between 3,044 and 3,069 m. The hydrocarbons were predominantly gas bearing with some additional liquid potential. Additional drilling was required to determine if the discovery was commercial. The company was the owner and operator of Block SL 2007–01–001. Two other blocks were under exploration (Rigzone.com, 2011).

Petroleum.—The Mannar Basin, which was parceled out into eight blocks, was believed to hold more than 1 billion barrels of oil. The five blocks not under license to Cairn Lanka were expected to be the focus of a new international licensing round in Sri Lanka. The country spent $2 billion per year for petroleum imports and was considering options to import 1 Mt/yr of liquefied natural gas (Petroleum Economist, 2011).

Outlook

Sri Lanka is expected to expand its output of downstream steel products to meet its domestic demand, particularly that of the construction industry. Production of excess capacity that is not used locally would be exported to Bhutan, the Dubai Emirate of the UAE, and the Maldives. Production of mineral sands is expected to increase as a result of Lanka Mineral Sands's purchase of new mining equipment and Government investment in a new plant. A discovery of natural gas in the Mannar Basin is expected to encourage the Government to initiate a new international licensing round in oil and gas exploration.

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TABLE 1
SRI LANKA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2007	2008	2009	2010	2011
Cement, hydraulic	thousand metric tons	1,700	1,800	1,900	2,000	2,200
Clays:						
Ball clay		43,004 [4]	52,966 [4]	54,873 [4]	47,826 [4]	50,000
Kaolin		11,178 [4]	10,039 [4]	9,538 [4]	8,207 [4]	8,000
Brick and tile clay		8,000	8,000	8,000	8,000	8,000
Clays for cement manufacture		950	950	950	1,000	1,100
Feldspar, crude and ground		28,866 [4]	32,586 [4]	73,365 [4]	75,405 [4]	70,000
Gemstones:						
Precious and semiprecious, other than diamond, value	thousands	$105,000	$108,000	$110,000	$150,000	$180,000
Cat's eye	carats	49,000	50,000	51,000	54,000	55,000
Ruby	do.	31,700 [4]	47,900 [4]	20,300 [4]	31,336 [4]	35,000
Sapphire	do.	240,000 [4]	541,900 [4]	986,500 [4]	1,491,698 [4]	1,600,000
Other	do.	2,200,000	2,300,000	2,400,000	2,500,000	2,400,000
Graphite, all grades		9,593 [4]	6,615 [4]	3,171 [4]	3,437 [4]	3,500
Iron and steel, metal, semimanufactures		77,905 [4]	66,809 [4]	72,000	75,000	76,000
Mica, scrap		3,224 [4]	2,364 [4]	2,347 [4]	2,095 [4]	2,100
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	2,300	2,300	2,400	2,600	2,700
Jet fuel	do.	700	750	750	800	800
Kerosene	do.	1,500	1,500	1,500	1,500	1,500
Distillate fuel oil	do.	5,400	5,500	5,600	5,700	5,800
Residual fuel oil	do.	5,000	4,800	4,800	4,500	4,600
Refinery fuel and losses	do.	730	740	750	760	800
Other	do.	2,400	2,500	2,600	2,700	2,800
Total	do.	18,000	18,100	18,400	18,600	19,000
Phosphate rock, gross weight		40,128 [4]	41,947 [4]	36,347 [4]	47,778 [4]	48,000
Salt		70,209 [4]	110,856 [4]	10,500	10,400	11,000
Stone:						
Limestone	thousand metric tons	1,095 [4]	1,091 [4]	1,145 [4]	1,192 [4]	1,200
Quartzite		35,066 [4]	37,196 [4]	30,409 [4]	34,437 [4]	36,000
Titanium mineral concentrates, gross weight:						
Ilmenite		70,728 [4]	22,159 [4]	122,424 [4]	52,637 [4]	52,000
Rutile		4,607 [4]	11,335 [4]	2,276 [4]	2,568 [4]	2,700
Zirconium, zircon, gross weight		11,000	41,000	9,000	11,000	30,000

do. Ditto.
[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.
[2]Table includes data available through July 16, 2012.
[3]In addition to the commodities listed, crude construction materials, such as calcite, dolomite, sand and gravel, sulfur, and varieties of stone presumably are produced, but available information is inadequate to make reliable estimates of output.
[4]Reported figure.

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TABLE 2
SRI LANKA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Cement		Holcim (Lanka) Ltd.	Puttalam	1,000
Do.		Sri Lanka Cement Corp. (Ministry of Industry and Commerce)	Kankesanthurai	1,000
Do.		do.	Puttalam	400
Do.		Tokyo Cement Co. (Lanka) Ltd.	Trincomalee	300
Clay, ball		Lanka Ceramic Ltd.	Dediyawala	NA
Graphite		Kahatagaha Graphite Lanka Ltd. (Ministry of Industry and Commerce)	Kahatagaha Mine	4
Do.		Bogala Graphite Lanka Ltd. (Graphit Kropfmühl AG, 87%, and Ministry of Industry and Commerce, 13%)	Bogala Mine	7
Petroleum, refined	42-gallon barrels per day	Ceylon Petroleum Corp. (Ministry of Petroleum and Petroleum Resources Development)	Sapugaskanda	51,000
Phosphate rock		Lanka Phosphate Ltd. (Ministry of Industry and Commerce)	Eppawala	40
Titanium, ilmenite sands		Lanka Mineral Sands Ltd. (Ministry of State Resources and Enterprise Development)	Pulmoddai	150

[e]Estimated. Do., do. Ditto. NA Not available.

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The Mineral Industry of Taiwan

By Pui-Kwan Tse

Taiwan is an island with a limited amount of mineral resources. Taiwan's economy was oriented towards exports, and the health of the economy was highly susceptible to conditions in the world markets. In 2011, the global economic conditions remained weak, especially in the European Union (EU), and exports to countries in the EU slumped. Demand for Taiwan's goods from the Asian markets remained relatively strong, however, and these markets accounted for 68% of the island's total exports. China was the leading destination of Taiwan's goods and received 27.2% of the total exports; Hong Kong, 13.0%; the United States, 11.8%; Japan, 5.9%; and Singapore, 5.5%. About 40% of Taiwan's exports were electronic products. Domestic demand for goods was strong, and, as a result, the output of the manufacturing sector increased by 4.9%. The island's gross domestic product (GDP) increased by 4.0% in 2011 compared with an increase of 10.7% in 2010. The signing of an Economic Cooperation Framework Agreement with China was expected to lead to significant growth in exports under the Early Harvest Program within the next several years; however, given the uncertain economic and financial outlooks in the Western countries, the growth of the GDP was expected to be slower during the next 2 years than in 2011 and to be more dependent on the export markets in the Asia and the Pacific region (Ministry of Finance, 2012a, b; Taiwan Statistical Bureau, 2012, p. 3, 41).

Minerals in the National Economy

Mineral resources of significance identified on the island included clay, coal, copper, dolomite, feldspar, gold, gypsum, natural gas, petroleum, serpentine, and talc. After several decades of mining, nearly all the recoverable coal, metallic minerals, and talc had been depleted. The output of the mining industry, which had a very small effect on the island's economy, was less than 1% of total industrial production. In 2011, the employment in the mining sector decreased to about 4,000 people (Taiwan Statistical Bureau, 2012, p. 13).

Production

The major mining activities in Taiwan were the production of dolomite, limestone, marble, natural gas, and petroleum. Natural gas and petroleum were produced on the western part of the island, and limestone and marble were mined on the eastern part of the island. In 2011, the production value of the major mineral commodities was $370 million, of which $183 million was from natural gas and $113 million was from marble. Besides natural gas and marble, sulfur was the island's most valuable mineral commodity. Because Taiwan had no domestic primary aluminum, copper, lead, or zinc smelting capacity, downstream metal producers relied on imports of ingots and scrap to produce products from these metals. Owing to high labor costs, environmental problems, and weak domestic demand, the output of these industries had gradually decreased during the past several years, and companies had moved their manufacturing facilities to mainland China and Southeast Asian countries. In 2011, the production of pig iron, natural gas, mica, and steel increased significantly, but the output of dolomite, limestone, serpentine, and silica sand decreased sharply (Taiwan Bureau of Mines, 2012).

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

Commodity Review

Metals

Aluminum.—Without any primary aluminum production on the island, aluminum product producers depended on imports of aluminum ingot and scrap to meet their needs. In 2011, the island imported 346,114 metric tons (t) of unwrought aluminum, 214,996 t of aluminum alloys, and 132,674 t of scrap to meet domestic demand. Unwrought aluminum was imported from Iran, South Africa, Tajikistan, the United Arab Emirates, and Australia (in descending order of volume of imports). Aluminum alloy was from the United Arab Emirates, Australia, Bahrain, and Qatar, and aluminum scrap was from Mexico, Belgium, Australia, South Africa, and the United States. Owing to increased demand for aluminum alloy on the island, CS Aluminum Corp. (CS Aluminum), which was a subsidiary of China Steel Corp. (CSC), expanded its aluminum products output capacity to 167,000 metric tons per year (t/yr) in 2010 from 122,000 t/yr in 1998. The company started the second phase of its aluminum alloy production capacity expansion in 2011. Once the expansion project is completed in 2014, the production capacity would be 319,000 t/yr (CS Aluminum Corp., 2012; Ministry of Finance, 2012b, p. 3-633–3-634).

Copper.—Without any refined copper production, the island relied on imported copper to meet its demand. In 2011, Taiwan imported 441,141 t of refined copper, 471,764 t of copper alloys, and 89,633 t of scrap. Refined copper was mainly from Chile, Japan, Australia, Peru, and Indonesia (in descending order of volume of imports), and copper alloy was from Japan, the Republic of Korea, Turkey, and Russia. Because of surging demand for copper from the electronics sector, Taiwan's copper consumption was estimated to be about 1 million metric tons (Mt) in 2011 (Ministry of Finance, 2012b, p. 3-633–3-635).

Iron and Steel.—Taiwan was the fifth ranked iron and steel producer in Asia behind China, Japan, India, and the Republic of Korea. Owing to the increased demand for steel products during the first half of 2011, crude steel output increased during that period. With the sluggish global steel market, especially in the European market, Taiwan's steel producers reduced their steel output in the second half of the year. Taiwan's downstream

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producers of steel products reduced their new orders, so CSC decided to reduce its steel output by 20% in December and to halt the production of its plate mill for 20 days for annual maintenance. CSC was the only integrated iron and steel producer on the island. In 2011, Taiwan imported 20.5 Mt of iron ore, which was an increase of 8.5% from that of 2010. Iron ore was mainly from Australia, 64.9%; Brazil, 27.3%; and Canada, 6.2% (Taiwan Iron and Steel Association, 2012, p. 78; World Steel Association, 2012).

Without any iron ore resources, CSC imported all its iron ore from overseas markets. During the past several years, the company tried to secure iron ore resources in Australia. CSC purchased a 2.5% share in the Roy Hill iron ore project in Australia from Pohang Iron and Steel Corp. (POSCO) of the Republic of Korea for $317.3 million. In doing so, CSC became a member of the consortium of POSCO and Japan's Manubeni Corp. and STX Corp., which together held a 30% stake in the Roy Hill project; the other 70% was held by Hancock Prospecting Pty Ltd. CSC would receive 1.38 Mt/yr of iron ore from Roy Hill when it starts producing in late 2014. This transaction was subject to Government approval in Australia and Taiwan. CSC sought eventually to increase its iron ore self-sufficiency to 15% during the next several years from its current level of 2% self-sufficiency (South East Asia Iron and Steel Institute, 2012a).

CSC signed an agreement with Metal Industries Research and Development Center to develop high-value-added products and to establish a Metal Industry High-Value-Added Engineering Research and Development Center to concentrate on developing a high-value-added motor industry cluster that will use hot-pressing advanced manufacturing processes and specialty alloy applications. It aimed to transfer these applications to Taiwan's downstream iron and steel producers to upgrade their competitive advantage with respect to other countries. CSC expected that the export value of high-value-added products would increase to $2.7 billion in 2016 and $5 billion in 2020 from $340 million in 2011 (South East Asia Iron and Steel Institute, 2012b).

Hai Kwang Enterprise Corp. planned to replace its 60-t electric arc furnace (EAF) with a 100-t EAF in Kaohsiung in 2014. Hai Kwang was a rebar producer that had an output capacity of 600,000 t/yr of crude steel and 800,000 t/yr of rebar from its two plant sites in Kaohsiung. After replacement of the EAF is completed, the company's crude steel output capacity would increase to 1.2 Mt/yr (South East Asia Iron and Steel Institute, 2011).

Industrial Minerals

Cement.—Owing to a lack of limestone resources and a limited market on the island, Taiwan's cement producers had gradually moved their production base to China in the late 1990s and expanded their cement output capacities there. Most of Taiwan's cement producers were located in the eastern part of the island, which accounted for more than 80% of the island's total output capacity. In 2011, Taiwan produced less than 17 Mt of cement and consumed about 12.3 Mt. Taiwan exported 4.4 Mt of cement to Nigeria, Singapore, Malaysia, Mauritius, and Australia (in descending order of volume). The demand for cement on the island had decreased gradually to about 12 Mt in recent years from 28 Mt in the 1990s, and cement exports had increased. The Taiwan authorities planned to cap cement exports at 30% of the total output by 2015 to encourage cement producers to phase out old inefficient plants (Ministry of Finance, 2012a, p. 3-114).

Taiwan's leading cement producer, Taiwan Cement Corp. (TCC), which had an output capacity of 11.2 Mt on the island, was positioned to take advantage of the market in southern China and to be a high-end cement producer there. TCC's investment strategy in China was to make direct investments and to form joint ventures with local cement producers. In 2011, TCC produced 9.5 Mt of cement in Taiwan, and the company had an output capacity of 60 Mt in mainland China in 2011. The company planned to build new plants in mainland China. The company acquired a 1-Mt/yr-output-capacity plant in Guizhou Province, China, from Kaili Shui On Co. (which was headquartered in Guizhou Province), and added two more production lines with a total capacity of 3 Mt/yr at the Guizhou plant. The company's total cement output capacity could reach 7 Mt/yr in Guizhou. TCC was also planning to increase its cement production capacity on mainland China to 100 Mt/yr by yearend 2014 (Taiwan Cement Corp., 2012, p. 37–39).

Taiwan's second ranked cement company, Asia Cement Corp., produced 4.6 Mt of cement in 2011; it also had cement plants on mainland China in the Provinces of Hubei, Jiangxi, and Sichuan, and planned to expand its cement production capacity in Sichuan Province. In 2011, Asia Cement sold more than 24 Mt of cement, clicker, and slag powder from its operations in China. The company had a total cement output capacity of 24 Mt/yr on mainland China (Asia Cement Corp., 2012, p. 2–5).

Mineral Fuels

Coal.—Taiwan had no domestic coal production and depended on imported coal to meet its demand for coal. Taiwan Power Co. was the leading coal consumer followed by the cement and iron and steel sectors. In 2011, Taiwan imported 66.6 Mt of coal, which was an increase of 5.3% from the amount imported in 2010; of that amount, 46.7 Mt was for power generation, and 8.9 Mt was for iron and steel. Thermal coal was imported mainly from, in decreasing order of supply, Australia, Indonesia, South Africa, Russia, and China. The island consumed 64.8 Mt of coal in 2011 (Taiwan Bureau of Energy, 2012a).

Natural Gas and Petroleum.—With its limited mineral fuel resources, Taiwan produced only about 0.02% of its petroleum requirements and relied on imports—mainly through long-term contracts with Angola, Iran, Kuwait, Saudi Arabia, and the United Arab Emirates—to meet the demand. The island produced about 7.7% of its natural gas in 2011. Taiwan imported a total of 16.0 million cubic meters of liquefied natural gas (LNG) from Qatar, Malaysia, and Indonesia (in descending order of volume of imports), which accounted for 76% of the island's total LNG imports. Taiwan consumed 15.0 million cubic meters of LNG, of which power generation accounted for 87.1% (Taiwan Bureau of Energy, 2012b).

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Outlook

Taiwan's economic growth is heavily dependent on external trade. The slow economic recovery in the United States and other developed countries in the West is expected to affect its exports. Trade and investments between Taiwan and China are expected to continue to increase in the years to come. Economic growth in Taiwan is expected to increase slowly during the next 2 years and to be more dependent on the economic growth in the Asia and the Pacific region. The service sector accounts for more than 70% of the GDP and, given the island's limited mineral resources, the mining sector is expected to have only a minimal effect on the island's economy in the future. The growth of the manufacturing sector is likely to be led by the computer, electronics components, and telecommunication products sectors. The island relies on imports of raw materials to support its iron and steel and nonferrous metals sectors. The rising prices of these raw materials could affect producers' profit margins, and tightened environmental regulations may force nonferrous metal and steel producers to relocate their production facilities to mineral-rich countries with lower labor costs. The island's economy has gradually been transforming from one that is led by a labor-intensive manufacturing sector to one that is lead by a knowledge-intensive service sector. The Taiwan authorities continue their effort to promote the island as a green island and to ease restrictions on economic ties with China, primarily in the areas of investment, tourism, trade, and transportation. Such changes would likely stimulate growth in the service sector.

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TABLE 1

TAIWAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011
METALS						
Iron and steel:						
Pig iron	thousand metric tons	10,550	9,750	7,939	9,358	12,940
Steel, crude	do.	20,883	19,222	15,566	20,498	22,879
Nickel, refined[e]		11,000	11,000	11,000	11,000	11,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	18,957	17,330	15,918	16,301	16,852
Fire clay		1,121	746	9	--	--
Lime[e]		450,000	450,000	450,000	460,000	460,000
Mica		3,387	3,179	557	--	1,455
Nitrogen, liquid[e]		800,000	800,000	800,000	800,000	800,000
Silica sand		193,135	249,824	328,153	305,882	173,354
Sodium compounds:[e]						
Caustic soda		570,000	570,000	570,000	570,000	570,000
Soda ash		140,000	140,000	140,000	140,000	140,000
Stone:						
Dolomite	thousand metric tons	94	104	70	117	67
Limestone	do.	210	227	232	45	7
Marble		26,452	25,811	24,146	25,118	24,351
Serpentine	thousand metric tons	280	264	242	97	64
Sulfur		249,156	211,869	252,392	231,700	219,975
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	417	357	351	290	330
Marketed[e]	do.	380	310	310	250	280
Petroleum:						
Crude	thousand 42-gallon barrels	112	101	101	91	71
Refinery products	do.	446,800	443,200	410,000	445,000	405,000

[e]Estimated; estimated data are rounded to no more than three significant digits. do. Ditto. -- Zero.

[1]Table includes data available through July 18, 2012.

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TABLE 2
TAIWAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilitites	Annual capacity[e]
Cement		Asia Cement Corp.	Hsinchu	1,800
Do.		do.	Hualien	4,020
Do.		Chia Hsin Cement Corp.	Kaohsiung	1,860
Do.		Chien Tai Cement Co. Ltd.	do.	1,720
Do.		Lucky Cement Corp.	Tungao	2,000
Do.		Southeast Cement Corp.	Kaohsiung	1,090
Do.		do.	Chutung	1,400
Do.		Taiwan Cement Corp.	Hualien	1,600
Do.		do.	Hualien Hsien	5,600
Do.		do.	Suao	3,400
Do.		Universal Cement Corp.	Kaohsiung	1,550
Marble		Taiwan Marble Co., Ltd.	Panchiao	15
Nickel		Taiwan Nickel Refinery	Kaohsiung	14
Petroleum:				
Crude	thousand 42-gallon barrels per year	Chinese Petroleum Corp.	Chuhuangkeng and Tungtzuchiao	850
Refinery products	do.	do.	Kaohsiung	570
Do.	do.	do.	Taoyuan	200
Do.	do.	Formosa Plastics Group	Yunlin	450
Steel		An Feng Steel Co. Ltd.	Kaohsiung	2,000
Do.		China Steel Corp.	do.	13,000
Do.		Dragon Steel Corp. (China Steel Corp.)	Taichung	2,500
Do.		Hai Kwang Enterprise Corp	Kaohsiung	600
Do.		Tang Eng Stainless Steel Plant	do.	300
Do.		Yieh Hsing Enterprise Co. Ltd.	do.	450
Do.		Yieh Phui Enterprise Co. Ltd.	do.	1,300
Do.		Yieh United Steel Co.	do.	1,000
Do.		Feng Hsin Iron and Steel Co. Ltd.	do.	1,200
Sulfur		China Petrochemical Development Corp.	Taipei	280

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.

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The Mineral Industry of Thailand

By Lin Shi

Thailand is one of the world's leading producers of cement, feldspar, gypsum, and tin. The identified mineral resources were being produced for domestic consumption and for export (Carlin, 2012; Crangle, 2012; Tanner, 2012; U.S. Department of State, 2012; van Oss, 2012).

Minerals in the National Economy

The growth rate of the gross domestic product (GDP) of Thailand in 2011 was 0.1% compared with 7.8% in 2010; the decrease in the rate of growth was the result of flooding, which was the worst that the county had encountered in 70 years. The unemployment rate was 0.7%, which was a decrease from the 1.0% rate of unemployment in 2010. The inflation rate increased to 3.8% from 3.3% in 2010. Thailand's mining and quarrying sector was important to the country's economy, but it was not a significant contributor to the GDP (Bank of Thailand, 2012b, p. 9).

Government Policies and Programs

The Government stimulus package helped move the country's economy to positive growth in 2010, and the Thai economy continued to experience strong growth in the first three quarters of 2011 until the flooding in the fourth quarter. By the fourth quarter of 2011, inflationary pressure had increased, and stimulus based on fiscal and monetary policy had become less necessary. The Government had cut the budget, decreased spending, and increased revenue collection, which together had lessened the stimulus's effect on the economy (Bank of Thailand, 2012b, p. 7–8).

The Ministry of Industry is the principal Government agency that oversees the country's mining sector. The Ministry's Department of Primary Industry and Mines (DPIM) administers the Minerals Act and issues mining regulations. The DPIM also provides technical assistance to the metallurgical, mineral processing, and mining industries. The Department of Mineral Resources (DMR) drafts national mineral policies and provides technical assistance for geologic prospecting and mineral exploration. The DMR conducts geologic mapping, manages mineral resources, performs mineral analyses, promotes environmental geology, and administers the mineral resources information center (Department of Mineral Resources, 2012).

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities in Thailand. Most of the nonfuel mineral mining and mineral processing companies in Thailand were privately owned and operated. The Electricity Generating Authority of Thailand (EGAT) and several coal mining companies owned and operated most of the county's major coal exploration and mining businesses. The Petroleum Authority of Thailand (PTT), PTT Exploration and Production Public Company Ltd. (PTTEP) and its joint ventures, and major multinational oil companies owned most of the country's petroleum and natural gas exploration projects and exploitation businesses. Thailand's mineral industry was engaged in mining and processing metallic and industrial minerals and exploring for crude oil and natural gas (table 2).

Mineral Trade

Thailand is a member of the World Trade Organization, and trade is important to the country's economy. The value of Thailand's exports increased by 9.5% in 2011 compared with an increase of 14.7% in 2010. The value of imports increased by 13.6% in 2011 compared with an increase of 21.5% in 2010. In 2011, the United States exported goods valued at $10.9 billion to Thailand, which included semiconductors valued at $1.5 billion; nonmonetary gold, $1,206 million; steelmaking materials, $369 million; and petroleum products, $337 million. Thailand's exports to the United States were valued at $24.8 billion in 2011 and included natural rubber valued at $1.0 billion; crude oil, $657 million; iron and steel products, $138 million; tin, $50 million; and bauxite and aluminum, $9.5 million. Thailand also exported to the United States $3.2 billion worth of computer accessories, peripherals, and parts; $2.5 billion worth of telecommunications equipment, except computers; and $1.1 billion worth of metal jewelry, such as watches and rings (U.S. Census Bureau, 2012a, b). Thailand's traditional major markets were the member countries of the Association of Southeast Asian Nations (ASEAN) (Indonesia, Malaysia, the Philippines, Singapore, and Vietnam), and Europe, Japan, and the United States. The growing Thai export markets included Australia, China (including Hong Kong), India, the Middle East, and South Africa.

Production

In 2011, Thailand's mineral production, including mineral fuel production, decreased by 1.8%, and manufacturing, including mineral-related manufacturing, decreased by 4.3% from that of the previous year. Cement production increased by 0.5% to 36.7 million metric tons (Mt) from 36.5 Mt in 2010, and clinker production decreased by 2.6% to 37.9 Mt from 38.9 Mt in 2010. Tin production decreased by 3.1% to 282 metric tons (t) from 291 t in 2010. Natural gas production decreased by 1.8% to 29.1 million cubic meters from 29.6 million cubic meters, and crude oil production decreased by 8.8% to 51 million barrels from 56 million barrels in 2010 (Bank of Thailand, 2012a, b, p. 7–8).

Commodity Review

Metals

Copper.—Exploration was continuing at the Puthep copper project in Loei. Thailand-registered Puthep Co. Ltd., which was a joint venture of Padaeng Industry Public Co. Ltd. of Thailand (51%) and PanAust Ltd. of Australia through its wholly owned

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subsidiary PNA Pty Ltd. (49%), was conducting the exploration. The project is located in northern Thailand within a short distance of PanAust's Vientiane office in Laos and comprises the PUT 1 and PUT 2 copper deposits, which are located 14 kilometers apart. In 2011, Puthep Co. was undertaking a strategic review of the project, including investigating the potential for selling the asset (PanAust Ltd., 2012, p. i).

Gold.—Kingsgate Consolidated Ltd. of Australia owned and operated the Chatree gold mine in central Thailand. In fiscal year 2011 (which ran from the beginning of July 2010 to the end of June 2011), the company produced about 2,400 kilograms (kg) of gold and about 17,100 kg of silver. The company mined 5.3 Mt of ore during the year; however, the milled ore had a lower than planned head grade, which caused gold production to decrease by 43% from the 4,125 kg produced in 2010. The company's new processing plant had an ore processing capacity of more than 5 million metric tons per year (Mt/yr), and Kingsgate expected to produce about 4,670 kg of gold in 2012 (Kingsgate Consolidated, Ltd., 2012 p. 10–11).

Zinc.—Padaeng was engaged in mining, milling, and smelting zinc and producing zinc alloys. The company's Mae Sod Mine is located in the Mae Sod district of Tak Province; the company rehabilitated the mine and applied for a new mining lease for the concession in 2010. Padaeng's smelter was located in the Muang district of Tak Province, the roaster plant was located in Rayong Province, and the head office was located in Bangkok. In 2011, zinc consumption in Thailand increased by 2% to 122,830 t, and the average annual price of zinc increased by 1.5% to $2,193. From its mining operations, Padaeng produced a total of 79,184 t of high-grade zinc ore, 57,153 t of zinc concentrate, and 29,664 t of zinc metal in 2011. The company produced about 136,000 t of zinc (grading 21.75%) at the Mae Sod Mine. In its smelter operations, Padaeng produced about 103,000 t of zinc metal in 2011; zinc alloy accounted for 34% of the output. The smelter also produced about 106,000 t of zinc cathodes, and used 3,000 t of secondary raw materials. Padaeng sold about 81,000 t of zinc to the domestic market, which accounted for 83% of the company's total annual zinc sales. Although the volume of Padaeng's zinc exports increased by 10% to about 14,000 t from that of the previous year, the volume of domestic zinc sales decreased by 13% (Padaeng Industry Public Co. Ltd., 2012, p. 10–12).

Industrial Minerals

Gypsum.—Thai Gypsum Products Public Co. Ltd. forecast that the market would grow by 5% to 10% in 2011 and that domestic demand for building materials would increase. The company shifted its focus to green and innovative gypsum products beginning in 2010. Thai Gypsum Products had the capacity to produce 75 million square meters per year of gypsum products. In 2011, it introduced a thermal insulation board and thermal tile to its line of products. Thai gypsum deposits occur in both northern and southern areas of the country; however, mining was concentrated in the southern part because of its proximity to the seaports. Siam Cement Group and Thai Gypsum Products were the two major suppliers to the Thai gypsum market. Thai Gypsum Products exported about 40% of its output (Businessweek.com, 2011).

Mineral Fuels

Natural Gas and Petroleum.—Chevron Corp. of the United States commenced natural gas production from the Platong II project in the Gulf of Thailand on October 24. Platong II, which is one of Southeast Asia's largest offshore structures, is located in shallow water 193 km from the southern coastline of Thailand. Chevron invested $3.1 billion in this project and expected to reach production of 9.3 million cubic meters per day of natural gas and 18 thousand barrels per day of liquid natural gas when the project is finished. Platong II was aimed at increasing the country's domestic natural gas production by more than 10% to meet Thailand's growing energy demand, and also increase Chevron's net natural gas production from the Gulf of Thailand by more than 20%. Chevron operated and held a 69.9% interest in the Platong II project, Mitsui Oil Exploration Co. Ltd. held a 27.4% interest, and PTT Exploration and Production Public Co. Ltd. held the remaining 2.7% (Chevron Corp., 2011).

Outlook

PanAust ranks the growth opportunity at the Puthep copper project lower than for other of the company's projects, and is considering selling the asset. Kingsgate plans to undertake further exploration and expansion at the Chatree Mine, and the company expects gold production at the mine to meet its planned annual target for 2012 by commencing and operating its new processing plant. Chevron acquired production rights in the Pakarang oil and gas field, which covers 118 square kilometers in the Gulf of Thailand, and is expected to invest about $605 million to develop the project. The World Bank upgraded Thailand's income categorization from a lower-middle income economy to an upper-middle income economy in July 2011 owing to the country's progress in economic development (Dow Jones & Company, Inc., 2012; Kingsgate Consolidated Ltd., 2012; PanAust Ltd., 2012).

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TABLE 1
THAILAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2007	2008	2009	2010	2011[e]
METALS					
Antimony:					
Ore:					
Gross weight	--	--	--	--	--
Sb content	--	--	--	--	--
Metal, smelter	271	422	555	500	500
Copper, metal, refined:					
Primary[e]	11,900	--	--	--	--
Secondary[e]	814	438	490 [2]	490 [2]	500
Total	12,714	438	490	490	500
Gold kilograms	3,401	2,721	5,400	4,125	2,372 [2]
Iron and steel:					
Iron ore:					
Gross weight	1,554,860	2,029,100	1,400,800	969,937	970,000
Fe content[e]	779,000	855,000	800,000	485,000	485,000
Crude steel thousand metric tons	5,565	5,211	3,646	4,145	4,000
Lead, metal	73,159	73,303	55,504	55,500	55,000
Manganese ore:					
Metallurgical grade, gross weight, 46% to 50% MnO_2	9,500	111,000	64,930	50,450	50,000
Mn content	4,550	52,700	31,200	24,200 [e]	24,000
Silver kilograms	7,727	5,465	15,300	17,092	17,098 [2]
Silicon, metal (gross weight)	--	--	NA	22,500 [e]	22,500
Tantalum, metal and oxide powder	142	158	50	50	50
Tin:					
Concentrate:					
Gross weight	149	235	210	370 [e]	400
Sn content	122	215	166	291	282 [2]
Metal, primary	23,104	21,860	19,423	20,000 [e]	20,000
Tungsten concentrate:					
Gross weight	923	1,112	950	950 [e]	900
W content[e]	477	617	600	600	600
Zinc:					
Ore:					
Gross weight	176,042	118,739	184,505	146,470	79,184
Zn content	32,921	17,811	34,000	25,529	29,664
Metal, primary	99,337	107,753	104,695	100,000 [e]	68,203 [2]
Alloy, Zn content	64,600	70,000	31,000	30,000 [e]	35,163
INDUSTRIAL MINERALS					
Barite	8,631	9,180	51,895	33,465	35,000
Cement, hydraulic thousand metric tons	35,668	31,651	33,562	36,496	36,700 [2]
Clays:					
Ball clay	563,353	1,499,993	1,000,000	1,000,000 [e]	1,000,000
Kaolin, marketable:					
Beneficiated, washed	159,186	162,215	160,000	160,000 [e]	160,000
Nonbeneficiated, unwashed	518,143	479,443	500,000	500,000 [e]	500,000
Filler	7,985	6,061	6,000	6,000 [e]	6,000

See footnotes at end of table.

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TABLE 1—Continued
THAILAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2007	2008	2009	2010	2011[e]
INDUSTRIAL MINERALS—Continued						
Diatomite		1,260	4,075	4,000	4,000 [e]	4,000
Feldspar		684,668	670,618	600,000	600,000 [e]	600,000
Fluorspar, crude, metallurgical grade		1,820	26,118	86,365	2,222	2,000
Gemstones	thousand carats	102	32	30	30 [e]	30
Gypsum	thousand metric tons	8,643	8,500	8,679	9,985	10,000
Perlite[e]		6,400	7,000	7,000	7,000	7,000
Phosphate rock, crude[e]		3,550 [2]	3,675 [2]	3,000	3,000	3,000
Salt:[e]						
Rock		1,134,931 [2]	1,211,581 [2]	1,200,000	1,200,000	1,200,000
Other		100,000	100,000	100,000	100,000	100,000
Sand, silica, glass[e]		844,071 [2]	495,848 [2]	500,000	500,000	500,000
Stone:						
Calcite		672,580	823,706	750,000	750,000 [e]	750,000
Dolomite		1,108,425	1,353,763	1,200,000	1,200,000 [e]	1,200,000
Granite:[e]						
Dimension stone	cubic meters	10,515 [2]	10,579 [2]	10,000	10,000	10,000
Industrial rock	thousand metric tons	5,229 [2]	5,190 [2]	5,000	5,000	5,000
Limestone:						
Construction and other uses	do.	87,402	87,000	90,000	90,000 [e]	90,000
Dimension stone	do.	233	233	200	200 [e]	200
For cement manufacture only	do.	63,799	54,885	60,000	60,000 [e]	60,000
Marble, dimension stone and fragment	cubic meters	848,806	664,930	760,000	760,000 [e]	760,000
Marl for cement manufacture only		31,750	41,720	99,300	68,000	68,000
Quartz		4,924	3,290	4,000	4,000	4,000
Shale for cement manufacture only[e]	thousand metric tons	4,769 [2]	4,026 [2]	4,000	4,000	4,000
Travertine[e]		3,490 [2]	3,640 [2]	3,000	3,000	3,000
Talc and related materials:						
Pyrophyllite		415,420	106,600	200,000	200,000 [e]	200,000
Talc[e]		3,508 [2]	3,264 [2]	3,000	3,000	3,000
Zirconium		1,023	--	--	--	--
MINERAL FUELS AND RELATED MATERIALS						
Coal, lignite	thousand metric tons	18,239	18,095	16,360	17,907	18,000
Natural gas, gross production	million cubic meters	25,400	27,576	26,362	29,583	29,100 [2]
Petroleum:						
Crude	thousand 42-gallon barrels	48,745	52,805	56,302	55,906	51,000 [2]
Natural gas condensate	do.	28,778	31,157	30,625	31,730	32,000
Refinery products:						
Liquefied petroleum gas	do.	48,759	53,842	57,531	66,180	66,000
Gasoline	do.	54,739	53,142	55,678	54,986	55,000
Jet fuel	do.	33,478	37,750	37,582	38,972	39,000
Kerosene	do.	776	1,226	584	2,935	3,000
Distillate fuel oil	do.	40,581	43,231	43,300	37,737	38,000
Residual fuel oil[e]	do.	27,109 [2]	26,500	30,000	25,000	25,000
Unspecified[e, 3]	do.	3,626 [2]	3,600	4,000	3,000	3,000
Total[e, 4]	do.	209,000	219,000	229,000	229,000	230,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. do. Ditto. NA Not available. -- Zero.

[1]Table includes data available through September 27, 2012.

[2]Reported figure.

[3]Includes refinery fuel and refinery gains or losses.

[4]Data are rounded to three significant digits; may not add to totals shown.

Sources: Department of Mineral Resources, Mineral Statistics of Thailand; Department of Primary Industries and Mines; Ministry of Energy, Energy Policy and Planning Office; and U.S. Geological Survey Minerals Questionnaires, 2007–2011.

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TABLE 2
THAILAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Antimony	metric tons	Amco Thai Mining Co. (Hibino Metal Industry)	Antimony smelter, Ban Pin, Phrae Province	555
Do.		Other companies	Various Thai Provinces	NA
Barite		Asian Mineral Resources Co. Ltd.	Loei, Mae Hong Son, Nakhon Si Thammarat, and Satun Provinces	60
Do.		P&S Barite Mining Co. Ltd.	Loei and Nakhon Si Thammarat Province	60
Cement		Asia Cement Co. Ltd.	Pra Phutthabath, Sara Buri Province	4,800
Do.		Jalaprathan Cement Co. Ltd. (Cement Francais S.A., 37%; Veatprapat Holding Co. Ltd., 19%; others, 44%)	Takli, Nakhon Sawan Province, and Cha-Am, Phetchaburi Province	2,350
Do.		Samukee Cement Ltd.	Pakchong, Nakhon Ratchasima Province	125
Do.		Saraburi Cement Co. Ltd. (CEMEX Asia Holdings Ltd., 99%)	Chalerm Phrakiat, Sara Buri Province	700
Do.		Siam Cement Industry Co. Ltd. (Bureau of the Crown Property, 30%; Thai Security Depository Co. Ltd., 6.94%; CPB Equity Co. Ltd., 5.6%; other financial institutions and the general public, 57.46%)	Kaeng Khoi, Phabhudhabat, and Khao Wong, Sara Buri Province; Chaehom, Lampang Province; Thung Song, Nakhon Si Thammarat Province; and Ta Luang, Phra Nakhon Si Ayutthaya Province	23,200
Do.		Siam City Cement Co. Ltd. (SCCC) (Holcim Ltd., 33.7%; Rattanarak family, 27%; other investors, 39.3%)	Kaeng Khoi, Sara Buri Province	14,500
Do.		TPI Polene Co. Ltd.	do.	9,900
Coal, lignite		Electricity Generating Authority of Thailand (EGAT) (Government, 100%)	Mae Moh, Lampang Province	20,000
Do.		Lanna Lignite Public Co. Ltd.	Ban Pakha, Lamphun Province	1,000
Copper		Thai Copper Industries Public Co. Ltd. (TCI)	Rayong Industrial Park	165
Feldspar, concentrate		Asia Mineral Processing Co. Ltd.	Provinces of Nakhon Si Thammarat and Trang	500
Fluorspar, concentrate		Asian Mineral Resources Co. Ltd.	Mae Hong Son Province	14
Gas, natural	million cubic meters per day	Esso Exploration and Production Khorat Inc.	Namphong, Khon Kaen Province	4
Do.	do.	TOTAL Exploration and Production (Thailand)	Bongkot in the Gulf of Thailand	15
Do.	do.	Unocal Thailand Ltd.	Baanpot, Erawan, Funan, Kaphong, Pladang, Satun, Pailin, Trat, all in the Gulf of Thailand	33
Gold	kilograms	Akara Mining Ltd. (Kingsgate Consolidated Ltd., 100%)	Chatree, Phichit Province	5,000
Gypsum		Vanich Gypsum Co. Ltd.	Khlong Prab, Mai Riang. Thoong Yai Mai in Nakhon Si Thammarat Province and Surat Thani Province	8,500
Do.		Lotus Mines Co. Ltd.	Nakornsawan	NA
Do.		General Mining and Trading Co. Ltd.	Talad, Muang	NA
Iron ore, gross weight		P.T.K. Mining Co. Ltd.	Phu Ang, Loei Province	720
Lead, in concentrate		Kanchanaburi Exploration and Mining Co. Ltd.	Song Toh, Nong Phai, and Bo Ngam in Kanchanaburi Province	55
Petroleum, crude, including condensate	thousand 42-gallon barrels per day	Chevron Offshore (Thailand) Ltd.	Benjamas, Tantawan, offshore in the Gulf of Thailand	35
Do.	do.	PTT Exploration and Production Public Co. Ltd. (PTTEP)	Arthit, Songkhla, Gulf of Thailand	20
Do.	do.	Thai Shell Exploration and Production Co. Ltd.	Sirikit in Kamphaeng Phet Province	24
Do.	do.	TOTAL Exploration and Production (Thailand)	Bongkot, offshore in the Gulf of Thailand	12
Do.	do.	Unocal Thailand Ltd.	Baanpot, Erawan, Funan, Gomin, Jakrawan, Kaphong, Pailin, Platon, Satun, Surat, Trat Plamuk, offshore in the Gulf of Thailand	38

See footnotes at end of table.

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TABLE 2—Continued
THAILAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Silicon, metal (gross weight)	metric tons	G.S. Energy Co., Ltd.	Ratchaburi silicon plant	25,000
Steel, rolled		The Bangkok Iron and Steel Works Co. Ltd.	Phrapradaeng, Samut Prakan Province	120
Do.		Bangkok Steel Industry Public Co. Ltd.	do.	300
Do.		Tata Steel (Thailand) Plc (Tata Steel Ltd., 67.11%; McDonald Investment, 6.5%; other investors, 26.39%)	Map Ta Phut, Rayong Province; Sriracha, Chonburi Province; Ban Mon, Sara Buri Province	1,700
Do.		Namheng Steel Co. Ltd.	Lop Buri Province	300
Do.		Sahaviriya Group Corp. Ltd.	Bang Saphan, Prachuap Khiri Khan Province	2,400
Do.		Siam United Steel Co. Ltd.	Rayong Province	1,000
Do.		G-Steel Plc (formerly Siam Ystrip Mill Plc)	Map Ta Phut, Rayong Province	600
Tantalum, metal powder and oxides	metric tons	H.C. Starck (Thailand) Co. Ltd. (H.C. Starck GmbH, 94.98%, and others, 5.02%)	do.	250
Tin:				
Concentrate		Numerous small companies	Nakhon Si Thammarat, Phangnga, Phuket, and Rayong Provinces	3
Refined		Thailand Smelting and Refining Co. Ltd. (Thaisarco) (Amalgamated Metal Corp., 75.25%, and other, 24.75%)	Phuket, Phuket Province	30
Tungsten, in concentrate	metric tons	SC Mining Co. Ltd. (Som Chai family, 100%)	Ban Pin, Phrae Province	650
Zinc:				
In concentrate		Padaeng Industry Public Co. Ltd.	Mae Sod district, Tak Province	65
Refined		do.	Smelter in Muang district, Tak Province; Roaster plant in Rayong Province	115

Do., do. Ditto. NA Not available.

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The Mineral Industry of Vietnam

By Yolanda Fong-Sam

In 2011, Vietnam ranked seventh in the production of crude petroleum in the Asia and the Pacific region. The country also produced chromium ore, coal, natural gas, ilmenite, lead, lime, crude petroleum, phosphate rock, salt, steel, and zirconium. As for major processed minerals, Vietnam produced cement, refined copper, rolled steel, refined tin, and zinc (table 1; U.S. Energy Information Administration, 2011).

Minerals in the National Economy

According to the General Statistics Office of Vietnam, the output value of the mining and quarrying sector (which included mineral fuels and nonfuel minerals) in 2011 decreased by about 7.6% to an estimated $1.065 billion[1] (in 1994 constant dollars) from $1.15 billion in 2010. The mining and quarrying sector made up 3.7% of the country's total estimated gross domestic product of $28.6 billion (in 1994 constant dollars) compared with about 4% in 2010 (General Statistics Office of Vietnam, 2011b).

Government Policies and Programs

In 2010, the Government of Vietnam created and approved several decisions and decrees to attract international interest in the country's potential for the production of nuclear energy. Vietnam's interest in pursuing nuclear energy was mainly to meet the country's growing demand for reliable sources of energy. In June 2010, the Government issued Decree 70/2010/ND–CP (Decree 70), which was implemented on August 10 of the same year. Decree 70 provides guidance for the implementation of the Law on Atomic Energy, which mainly regulates the construction, decommissioning, emergency response, operation, and safety of nuclear power plants. Decree 70 requires interested investors to comply with the country's master plan on electricity development, which is reviewed every 10 years, to acquire the necessary permits to start a business in Vietnam. Under this decree, the Ministry of Construction is the Government entity in charge of regulating the construction of nuclear power turbine units; the Ministry of Industry and Trade (MOIT) is in charge of drafting and enforcing all technical regulations pertaining to nuclear power turbine units; and the Ministry of Science and Technology (MST) is in charge of regulating nuclear power safety in the construction, design, dismantlement, selection of location, and operation of the nuclear power turbine units. In addition, the MST coordinates with the Ministry of Natural Resources and Environment (MONRE) for contingency planning for the control of radiation in an emergency and creates standards for radioactive emissions and management of radioactive waste and spent nuclear fuel. The MST issues construction licenses, and the MOIT issues licenses for trial operations as well as the final operation licenses (electricity activity license) for nuclear powerplants (Mayer Brown JSM, 2010b).

In August 2010, under Decision 906/QD–TTg [(Decision 906), which was originally signed on June 17, 2010], the Government announced its plans to build 14 nuclear power reactors by 2030. The plants would have a total combined capacity of between 15,000 megawatts (MW) and 16,000 MW, which was equivalent to 10% of the country's current total electricity capacity. The plants would be built in various locations in central Vietnam; construction of the first one was scheduled to start in 2015, and the plant would be commissioned by 2020. Subsequent plants were planned to be in construction simultaneously after 2020 and to commence operations by 2030. Decision 906 proposes the creation of a nuclear safety agency and encourages the participation of local companies to fulfill the demand for construction materials and equipment; it also encourages local companies to participate in the construction, inspection, installation, and supervision stages of the project. The Government announced that the first four nuclear turbine units, collectively called the Ninh Thuan Nuclear Power Project, would be built in Ninh Thuan Province and that the investor would be the Electricity of Vietnam Group. Subsequent nuclear plants were planned to be located in the following Provinces: Binh Dinh, Ha Tinh, Phu Yen, and Quang Ngai, with each site hosting between four and six nuclear turbine units (Mayer Brown JSM, 2010a).

In September 2010, the Government announced its plans to continue collaboration with its Chinese counterparts for the purchase of electricity as part of the country's efforts to secure dependable energy sources for its future demand. On behalf of the Vietnamese Government, Electricity of Vietnam Group negotiated contracts for the purchase of electricity until 2015. In addition, as a member of the Association of Southeast Asian Nations (ASEAN), the Government negotiated the purchase of power from other countries in the region. Vietnam is part of the ASEAN power grid plan, which was initiated in 2000 to help provide a continuous power supply in the region by creating a power network among Southeast Asian countries. By the end of 2010, Vietnam had power grid connections with Cambodia and Laos, and links with the power grids of Burma and Thailand were in the development stage (no further details were available as to when the projects would be commissioned) (Thanh Nien News, 2010).

In November 2010, the National Assembly of Vietnam passed the 2010 Mineral Law, which became fully effective on July 1, 2011. The new mineral law replaces the 1996 Mineral Law, as amended in 2005. The new law protects unexploited minerals and regulates geologic surveys for mineral resources, mineral exploration and mining, and the management of minerals located within all the territory under the control of Vietnam, including its islands, onshore bodies of water, sea

[1]Where necessary, values have been converted from Vietnam dong (VND) to U.S. dollars (US$) at the rate of VND20,454=US$1.00 for 2011 and VND18,921=US$1.00 for 2010.

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territory, contiguous zones, exclusive economic zones, and the continental shelf. To promote sustainable development and ensure that mined products are used in a cost-effective and efficient way, the Government has begun developing mineral master plans and a new mineral strategy every 10 years that includes an outlook that covers 20 years into the future. The MONRE oversees and coordinates with other Ministries to prepare the mineral strategy and then submits it to the Prime Minister for approval. The Government assigned MONRE as the authority to regulate all minerals throughout the country (Mayer Brown JSM, 2011).

The new mineral law implements changes to the existing legal framework for mineral exploration and exploitation, including reforming the process for acquiring mining licenses and requiring financial commitments on the part of the license holder. The license holder is required to have equity equivalent to at least 50% of the total proposed capital investment for an exploration project and at least a 30% equity interest for a mining project. The law contains new provisions regarding the auctioning of mining rights and the fees involved in the acquisition of the mining rights. The Government is in charge of collecting all fees related to the acquisition of mining licenses, and rates are based on the quality and type of the minerals to be mined, the mining conditions, the reserves, and the value of the property. Under the new law, previous prerequisites for the acquisition of mining licenses are changed or eliminated. The requirement for a prospecting license is eliminated; under the new law, the interested party (which must be eligible to conduct mineral exploration in the country) is required only to have written permission from the Provincial government to conduct field surveys and collect surface samples for exploration purposes at the location of the proposed exploration area. Under the new law, the Government encourages the export of minerals as long as domestic needs are met (Mayer Brown JSM, 2011).

The new law also requires that the issuance of mineral mining rights to be conducted through auction as a way to enhance the transparency of the process. Two types of mineral licenses that may be auctioned are the mineral exploration license and the mineral mining license. To acquire a mining license, a mining investment project must be proposed during the term of the mineral exploration license. Mineral exploration licenses and mining licenses for construction materials, peat, and minerals obtained through small-scale mining are issued by the Provincial People's Committee, which is the authority in each of the country's Provinces. The committee also issues licenses for individual or artisanal mining. Licensing for exploration and mining of larger scale mining is managed by the MONRE. The same licensing body that issued a license also has the authority to extend, suspend, transfer, or withdraw the license (Mayer Brown JSM, 2011).

The issuance of a mineral exploration license requires the applicant to satisfy certain conditions, including but not limited to being selected by the state or winning an auction to work on an unexplored area; submitting a proposal for mineral exploration that is consistent with the country's mineral master plan; and having equity equivalent to at least 50% of the total investment capital needed to implement the proposed project. The mineral exploration license carries a maximum duration of 48 months, with the possibility for extension for periods not to exceed 48 months per extension. In each subsequent extension, the license holder is subject to surrender at least 30% of the exploratory site under the license. The issuance of a mineral mining license requires the applicant to have a mineral mining investment project for an area that has been explored and for which exploration studies have yielded positive results for mineral reserves that have been approved for consistency with the country's mining master plan. In addition, the applicant must have an environmental impact assessment report that is consistent with the country's legislation on environmental protection and have equity equivalent to at least 30% of the total investment capital needed for the mining project. All mining licenses are granted for a maximum of 30 years and may be extended for a period not to exceed an additional 20 years (Mayer Brown JSM, 2011).

On April 29, 2011, the General Department of Vietnam Customs and its counterpart, the General Department of Customs and Excise of Cambodia, reached a cooperation agreement to facilitate trade between the countries and counter cross-border smuggling and illegal transportation and exchange of goods and information (Vannak, 2011).

In August 2011, the Ministry of Finance of Vietnam issued Circular 111, which stipulates a 10% tax on the export of jewelry containing 80% or more gold content. Before the release of the circular, the tax was imposed only on jewelry containing 99% gold content. The tax also applies to such items as articles made of gold and of metal clad with gold, silver, or precious metals with gold content of 80% or more. Other articles, such as gold-plated pieces with unwrought platinum, gold in semimanufactured forms, and gold powder with gold content of 99.9% or less will also be taxed (Ministry of Finance of Vietnam, 2011b).

On September 11, 2011, the Ministry of Finance of Vietnam issued Circular 108/2011/TT–BTC (Circular 108), which regulates primarily the export tax on minerals and metals and the import tax on mainly manufactured commodities. Under this circular, export taxes charged to aluminum and lead ingots increased to 15% from 5%; coal, copper alloys, refined copper, and silica, to 20% from 15%; and tin and zinc ingots, to 10% from 5%. On September 15, the Ministry of Finance issued Circular 129/2011/TT–BTC (Circular 129), which puts forth the regulations for the collection, payment, and usage of all fees accrued from mineral activities in the country. The Ministry collects the fees per exploration license based on the size of the property. For areas that are less than 100 hectares (ha) [1 square kilometer (km^2)] in size, the fee is about $200 (reported as 4 million dong); for areas between 100 ha and 50,000 ha (500 km^2), the fee is about $490 (reported as 10 million dong); and for areas greater than 50,000 ha, the fee is about $730 (reported as 15 million dong). Circular 129 also establishes the fees for mining licenses, which are a minimum of about $49 (reported as 1 million dong) per license for the extraction of commodities, such as gravel, from streams and sand and a maximum of about $4,890 (reported as 100 million dong) per license for the extraction of other minerals. The circular did not include other details regarding the fees established for other specific minerals (Ministry of Finance of Vietnam, 2011a, c).

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On December 28, Circular 197/2011/TT–BTC (Circular 197), which provides the guidelines for the preferential import duty that applies to gasoline and aviation fuels, came into effect. The applicable import fees for such commodities went from 0% to 4% (Ministry of Finance of Vietnam, 2011d).

Production

In 2011, mineral production increased mainly for zirconium (by about 103%), antimony (18%), iron ore (12%), phosphate rock (10.2%), and cement (about 6%). Production decreased for natural gas (by 9.8%), titanium (6.4%), sand and gravel (about 6%), and rolled steel (by about 5%). Data on mineral production are in table 1.

Structure of the Mineral Industry

According to the General Statistics Office of Vietnam, the number of employees working in the mining and quarrying sector in 2011 was approximately 279,100, which accounted for less than 1% of the total number of employed people in the country. Investments in the mining and quarrying sector for 2011 accounted for about $1.14 billion (in 1994 constant dollars), which represented about 6.4% of the total investments in the country (General Statistics Office of Vietnam, 2011a, c). Table 2 is a list of major mineral industry facilities.

Mineral Trade

In 2011, total trade in Vietnam increased by approximately 30% to $203.7 billion from $157 billion in 2010. The total value of exports in 2011 was about $97 billion compared with $72.2 billion in 2010 (an increase of about 34%). Exports of coal decreased by about 14% to approximately 17.2 million metric tons (Mt) from about 20 Mt in 2010; exports of crude oil increased by 2% to 60.6 million barrels (Mbbl) from 59.4 Mbbl (revised) in 2010. In 2011, the total value of imports increased by about 26% to $106.7 billion from $84.8 billion in 2010. State companies have a large role in the country's mining industry, which has the effect of limiting the availability of mining statistical data and mineral trade information (General Statistics Office of Vietnam, 2011d, g).

Vietnam's main trading partners in 2011 were Australia, Cambodia, China, Germany, Japan, the Republic of Korea, Malaysia, Singapore, Taiwan, Thailand, and the United States. The United States was Vietnam's leading export partner; the United States imported $16.9 billion in Vietnamese goods (which was equivalent to 17.4% of Vietnam's total exports), followed by China, which imported $11.1 billion (11.4% of Vietnam's total exports), and Japan, which imported $10.8 billion (11.1% of Vietnam's total exports). Vietnam's imports came mainly from China (which supplied 23% of Vietnam's total imports valued at an estimated $24.6 billion), the Republic of Korea (12.4% of total imports valued at an estimated $13.2 billion), and Japan (9.7% of total imports valued at about $10.4 billion) (General Statistics Office of Vietnam, 2011e, f).

Commodity Review

Metals

Antimony.—The Khe Chim deposit is part of the Khe Chim-Duong Huy mineralization zone in Quang Ninh Province. The deposit is located in the town of Cam Pha, which is about 30 kilometers (km) northeast of Ha Long City. A total of 12 ore bodies have been discovered in the deposit, which measures about 710 meters (m) long and 0.5 m to 2.8 m thick, and has a content of 6.62% to 24.35% antimony. The estimated antimony reserve in this deposit is 35,000 metric tons (t) of antimony content (Dr. Tran Kim Phuong, Representative for Vietnam Institute of Geosciences and Mineral Resources, written commun., June 28, 2011).

The Lang Vai deposit, which is located in Tuyen Quang Province, is considered the largest antimony mineralization deposit in the country. The deposit was discovered in 1962 and was explored until 1968. The antimony reserve in this deposit has been estimated to be 11,750 t of ore, and resources have been estimated to be 98,000 t with a content of 15% antimony. This deposit also had the potential to produce gold as a byproduct, given the gold content of 2.24 grams per metric ton (g/t) of ore. Six ore zones of commercial significance had been identified and explored: Cang Coc, Coc Tay, Hoa Phu, Khuon Phuc, Lang Vai, and Long Can. The ores had a surface area of between 600 m and 1,200 m in length and a few hundred meters in width (Dr. Tran Kim Phuong, Representative for Vietnam Institute of Geosciences and Mineral Resources, written commun., June 28, 2011).

The Mau Due deposit was named after the Mau Due commune, which is located in the Yen Minh District about 120 km northeast of the town of Ha Giang in Ha Giang Province. The deposit was discovered by local people in 1992, and had been mined ever since. The facility included a processing factory and a refining furnace. The Mau Due deposit has reserves of up to 60,000 t of antimony ore. Other antimony occurrences in Vietnam have been identified in the areas of Na Bac (located in Lac Son District, Hoa Binh Province) and Yen Ve (Nho Quan District, Ninh Binh Province) and in the Provinces of Lai Chau, Nghe An, Quang Ninh, and Thanh Hoa (Dr. Tran Kim Phuong, Representative for Vietnam Institute of Geosciences and Mineral Resources, written commun., June 28, 2011).

Bauxite and Alumina and Aluminum.—In October 2010, the state-owned holding company Vietnam National Coal and Mineral Industries Group (VINACOMIN) announced that the company was planning to start exporting alumina by mid-2011 from its Tan Rai alumina and bauxite complex, which is located in the Bao Lam District in Lam Dong Province in the country's Central Highlands. Later, the company announced that it would delay such plans until the second quarter of 2012, mainly because of frequent electricity supply interruptions in the project area, the slow delivery of imported equipment, the lack of laborers, a shortage of capital to finalize road infrastructure needed for transportation purposes, and constant unfavorable weather. Despite all the difficulties encountered in 2011, construction of the Tan Rai complex was 90% completed. In March 2011, Ha Tu Coal Joint Co. (a subsidiary

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of VINACOMIN) started some mining work at the complex's Tan Rai bauxite mine. VINACOMIN, which had invested about $700 million in the Tan Rai complex, estimated that the plant would have a production capacity of 600,000 metric tons per year (t/yr) of alumina when completed; the company was planning to increase the output capacity to 1.2 million metric tons per year (Mt/yr) of alumina by 2015. The estimated life of the project was 30 years. The Tan Rai complex was to include a bauxite ore sorting plant, a coal gasification plant, a powerplant, and a water treatment plant (Minh, 2010, p. 8–9; Mining Journal, 2010; Aluminum International Today Journal, 2011; Vietnam National Coal Mineral Industries Holding Co. Ltd., 2012).

In Dak Nong Province, VINACOMIN was also building another bauxite project to be commissioned by 2013 at a cost of $665 million. The Nhan Co mining and refinery complex would include an alumina refinery and a bauxite ore sorting plant. The capacity of the project was estimated to be 650,000 t/yr of alumina. VINACOMIN also announced that the majority of the production would be exported owing to the lack of interest from domestic industries to buy the locally produced product. With the commissioning of the Tan Rai and Nhan Co projects, the country was expected to produce about 1,250,000 t/yr of alumina at full capacity, from which between 600,000 t/yr and 900,000 t/yr would be sold to the Yunnan Metallurgical Group of China in a 30-year sales agreement. Vietnam's bauxite ore reserves were estimated to be between 5.6 billion metric tons (Gt) and 8.3 Gt, which could potentially place the country as the world's third ranked producer after Australia and Guinea (Minh, 2010, p. 8–9; Mining Journal, 2010; Vietnam National Coal Mineral Industries Holding Co. Ltd., 2012).

In May 2011, Vietnam's Department of Geology and Minerals announced that it would start a study of bauxite and laterite deposits in the country at a cost of $19.8 million. The study, which was to cover a total area of 14,000 km², was proposed to last from October 2011 to September 2015. The area to be studied is located in the Central Highlands of the country and covers the areas of Binh Dinh, Binh Phuoc, Binh Thuan, Dak Lak, Dak Nong, Dong Nai, Gia Lai, Kon Tum, and Lam Dong. These plans followed an earlier announcement from the Government concerning its plans to conduct a broader general assessment of the country's geology and its mineral resources; the plan was expected to be finalized by 2020 (Lismore, 2011).

Bismuth, Copper, Fluorspar, Gold, and Tungsten.—The Nui Phao Mine is an open pit mine located in the Dai Tu District of Thai Nguyen Province in northern Vietnam. The mine contains bismuth, copper, fluorspar, gold, and tungsten. The Nui Phao deposit stretches 2 km east to west, that measures 200 by 400 m in width, and is 159 m thick on the east side and 43 m thick on the west side. The Masan Group of Vietnam acquired the Nui Phao mining project in 2010, and since then it had identified 52.5 Mt of ore with an average content of 0.21% tungsten trioxide equivalent. The company had also estimated the Nui Phao deposit's grades to be 8% fluorspar, 0.22 g/t gold, 0.21% copper, and 0.10% bismuth. The company was expecting the project to be commissioned in 2013 (Masan Group, 2012a–c; Dr. Tran Kim Phuong, Representative for Vietnam Institute of Geosciences and Mineral Resources, written commun., June 28, 2011).

VINACOMIN announced in September 2010 the discovery of a copper ore reserve estimated to be 50 Mt located in the northern part of the country. With this finding, the company doubled its estimate of reserves in Lao Cai Province, which had been 56 Mt, to more than 100 Mt of ore. The new reserves were identified in the Sin Quyen Mine (20 Mt), which was operated by Sin Quyen Copper Co., and Vi Kem Hamlet, which is also located in the Bat Xat District (30 Mt). The Sin Quyen Mine processed 1.2 Mt/yr of ore. The company was planning to increase the Lao Cai copper complex mining capacity to 3 Mt/yr from 1.2 Mt/yr by the end of 2012 (Thomson Reuters, 2010, p. 8).

Gold.—In April 2011, Triple Plate Junction Plc (TPJ) of the United Kingdom announced the start of a 3,000-m diamond-core-drilling program in its Pu Sam Cap gold project Lai Chau Province in northwestern Vietnam, specifically in the Bai Bang prospect. The company budgeted $1.65 million for the drilling program, which would include core drilling and soil sampling to define high-grade near-surface gold resources. TPJ held a 70% interest in the project, and the Vietnamese Government and Province-owned companies held the remaining 30%. In December 2010, under the new Mineral Law, the Government issued a new exploration license to TPJ covering a total area of 27 km² of the Pu Sam Cap gold project (Triple Plate Junction Plc, 2011, undated).

Iron and Steel.—In June 2010, the Vietnam Shipbuilding Industry Group (VINASHIN) reported that it had produced the first batch of steel plate made locally at its Cai Lan steel plate hot-rolling plant. The steel plates were in high demand and consumed mainly by the local ship building industry, which used to import the commodity from China, Japan, and the Republic of Korea. VINASHIN invested $153.2 million (reported as 2.9 trillion Dong) in the business, which had an estimated production capacity of 1 Mt/yr of steel products (SteelGuru.com, 2010).

In July 2010, Kobelco Iron Nugget Vietnam Ltd. (a subsidiary of Kobe Steel Group of Japan) started the construction of the first sponge iron plant in Vietnam at a cost of $1 billion. The plant was located in Hoang Mai Industrial Zone in Quynh Luu District, Nghe An Province. The project was proposed to be built in two phases; the first phase was expected to be commissioned by 2013 and would have the capacity to produce 1 Mt/yr of sponge iron. The company planned for 50% of the production to be for local consumption, and the rest would be exported to Japan. The Thach Khe iron mine located in Ha Tinh Province would be the main source to feed for the sponge iron plant (Sai Gon Giai Phong Daily, 2010).

In December 2010, Formosa Plastics Group of Taiwan announced its plans to invest $8 billion in a carbon steel plant in Vietnam. The company planned for the project to be commissioned in 2014. No further details were offered regarding the location and capacity of the plant, although the company mentioned that this project could potentially become the second largest carbon steel plant in the Asia (Vietnam Business Times, 2010).

Titanium.—Vietnam has a coastline that extends for 3,260 km with sand deposits that contain ilmenite, rutile, zircon and other heavy minerals. About 40 coastal placers hosted by

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Quaternary sediments have been discovered along the country's coastline, from the Mong Cai area (Quang Ninh Province) to the Ham Tan area (Binh Thuan Province). The main groups of deposits are concentrated on the coast of central Vietnam from Cua Hoi (Ha Tinh Province) to Vung Tau (Ba Ria-Vung Tau Province). Four deposit groups that were of economic value had been identified: Cat Khanh (Binh Dinh Province), Ham Tan (Binh Thuan Province), Ky Anh (Ha Tinh Province), and Thuan An (Thua Thien-Hue Province). The average content of ilmenite in mineral sands is about 50 to 100 kilograms per cubic meter, and in some areas, the content can be as high as 700 to 800 kilograms per cubic meter. In most placer deposits, about 80% of the material consists of fine-grain fractions of 0.05 to 0.5 millimeter. Based on discovered coastal placer deposits in Vietnam, estimates of the total titanium mineral reserves were 26.5 Mt of ilmenite, 600,000 t of zircon, and 37,000 t of REOs (monazite) (Dr. Tran Kim Phuong, Representative for Vietnam Institute of Geosciences and Mineral Resources, written commun., June 28, 2011).

Industrial Minerals

Barite.—Vietnam's Institute of Geosciences and Mineral Resources had identified and assessed more than 20 deposits and occurrences of barite with total reserves of 6.2 Mt. Vietnam's primary barite resources are located in three areas in the northern part of the country near the borders with China and Laos and near the coast of the Bac Bo Gulf (Gulf of Tonkin) in North Trung Bo, specifically in the regions of northeastern and northwestern Bac Bo and in north Trung Bo. In 2010, the Ao Sen deposit located in the northeastern Bac Bo region, Son Duong District, Tuyen Quang Province, produced the most barite of all the deposits being mined. This deposit had the capacity to produce about 80,000 t/yr and had estimated reserves of about 394,000 t of barite. Most of the barite produced from the Ao Sen deposit was used by the chemical and oilfield industries. Vietnam had developed plans to expand its barite mining industry, which included projects to be commissioned by 2015, such as an expansion project to increase the production of barite to 10,000 t/yr in the Lang Cao deposit in Bac Giang Province, and the construction of two barite processing plants—one in Cao Bang Province with a capacity of 50,000 t/yr of barite and another in Lai Chau Province with a capacity of about 42,000 t/yr of barite. By 2025, the Government expected the country to be producing about 350,000 t/yr of barite ore (Phuong, 2011).

Cement.—In early 2010, the Ministry of Construction requested the People's Committees of the cities of Can Tho, Danang, Ha Noi, Hai Phong, and Ho Chi Minh City to halt all approvals for permits for the construction of new cement plants in these cities until 2020. The request came as a result of the forecast of an oversupply of cement for 2011 and 2012 mainly owing to the continuous commissioning and expansion of new and existing cement plants, respectively. The Government urged the state-run Vietnam National Cement Corp. (VICEM), which was the main cement producer in the country, and other manufacturers to increase their exports of cement to deal with the forecasted oversupply. In November 2010, to back up its request that the Government suspend the licensing of new cement production projects, the Ministry of Construction indicated that the cement sector had put stress on the country's fragile energy infrastructure (as many plants were not energy efficient) and caused power shortages in many regions of the country. In late 2010, the Building Materials Department under the Ministry of Construction announced that it was developing a master plan to restructure the cement industry to 2015 and beyond (with a forecast to 2025) to be submitted to the Government for evaluation. As of December 2009, there were 97 cement plants in operation in Vietnam, for a total production capacity of 57.4 Mt/yr of cement; 13 plants were commissioned through 2010 for an additional 11.7 Mt/yr of cement production capacity. In 2011, the country expected the commissioning of another 12 plants for an additional 9.35 Mt/yr of cement production capacity, and 8 more plants were planned for 2012, which would provide an additional 6.9 Mt/yr of capacity (International Cement Review, 2010a, b; World Cement, 2010, p. 40, 42; GlobalCement.com, 2012).

In December 2010, VICEM's cement plant, Bim Son, which was located in Thanh Hoa Province, started operation at its second production line, which boosted the plant's capacity to a total of 3.8 Mt/yr of cement. In January 2011, VICEM's But Son cement plant, which was located in Ha Nam Province, was commissioned; the plant had a total production capacity of 1.6 Mt/yr of cement (World Cement, 2011, p. 24).

In July 2011, Quan Trieu Cement Joint Stock Co. (Viet Bac Mining Industry Corp. and VINACOMIN) announced the commissioning of the Quan Trieu cement plant located in Thai Nguyen Province. The cement plant had a designed production capacity of 820,000 t/yr of cement (Vietnam National Coal Mineral Industries Holding Co. Ltd., 2011).

In 2011, the cement industry in the country had an oversupply of cement and sought to export the extra cement to neighboring countries. According to the Vietnamese Cement Association, the country's cement production for 2012 was estimated to be 60 Mt/yr, from which a little more than 50 Mt/yr was for domestic consumption. In recent years, VICEM had been exporting cement to Cambodia, China, India, Laos and South Africa, but given Vietnam's infrastructure, it had struggled to ship cement overseas mainly because of high costs, making the exportation less profitable (World Cement, 2010, p. 42; GlobalCement.com, 2012).

Fluorspar.—The Binh Duong fluorspar deposit is located in Nguyen Binh District, Cao Bang Province, and had a proved reserve of 5,341 t with an average of 30% contained CaF_2, although calcium fluoride content in alluvial ores can vary from 41.57% to 79.64% (with an average of 51.11%). The fluorspar produced in this deposit was used in various cement plants in northern Vietnam as catalysts to decrease the portland cement clinker calcination temperature. The product had proven to decrease the calcination temperature by between 20 to 50 degrees Fahrenheit compared with the case without calcium fluoride (Dr. Tran Kim Phuong, Representative for Vietnam Institute of Geosciences and Mineral Resources, written commun., June 28, 2011).

At the Dong Pao deposit located in Lai Chau Province, the fluorspar is associated with other minerals, such as rare earths and barite. The reserve is estimated to be about 1 Mt;

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however, the mining in this deposit had proven to be difficult because of its location (Dr. Tran Kim Phuong, Representative for Vietnam Institute of Geosciences and Mineral Resources, written commun., June 28, 2011).

The Xuan Lanh fluorspar deposit is located in Phu Yen Province in central Vietnam. The proven reserve of fluorspar was about 277,500 t, and the probable reserve was estimated to be about 105,500 t. The average content of calcium fluoride in this deposit was 53.5%, whereas the CaF_2 content of the rich-grade ores was as high as 67.7%, and that of the medium-grade ores was as high as 46.4%. In the past, mined fluorspar from this deposit was exported to Japan (Dr. Tran Kim Phuong, Representative for Vietnam Institute of Geosciences and Mineral Resources, written commun., June 28, 2011).

Rare Earths.—In October 2010, Toyota Tsusho Corp. of Japan announced that it had entered into a joint-venture agreement to develop a rare-earth minerals project in Vietnam along with partners Sojitz Corp. of Japan and VINACOMIN. The Dong Pao project, which included a mine and a refining plant, is located in the northwestern part of the country in Lai Chau Province and was planned to be commissioned by 2013. Toyota Tsusho said that the project would produce light rare-earth oxides (REOs), which are used mainly in the production of batteries, catalysts used for oil refining, ceramics, glass, lasers, and magnets. During 2011, Toyota Tsusho was working toward acquiring the mining rights for the project. By 2012, the company was planning to start preparations for the development of the refining plant, which, according to plans, would start up with a production of about 3,000 t/yr of REOs, with the potential for an increase to 6,000 t/yr of REOs at full capacity (Watts, 2010; 2012, p. 21; Watts and others, 2011; Toyota Tsusho Corp., 2012).

In the past few years, exploration had been centered in Lai Chau Province (at three fluorocarbonate primary ore deposits in Dong Pao, North Nam Xe, and South Nam Xe) and Yen Bai Province (at the Yen Phu deposit). The ore in the deposits located in Lai Chau Province are mainly composed of bastnaesite and associated minerals, such as barite, fluorspar, and strontium. Most of Vietnam's rare earths are primary ore with a complex composition of minerals of the rare-earth carbonate group; specifically, bastnaesite and parisite. In addition to the occurrence of light rare-earth elements, it was thought that other elements could also be present, such as barium, fluorine, niobium, strontium, titanium, uranium, and some of the heavy rare-earth elements. This is the case for the Yen Phu deposit, which is located approximately 200 km northwest of Ha Noi; it has a reserve of about 5,000 t of heavy rare earths containing 30% to 40% REOs (Dr. Tran Kim Phuong, Representative for Vietnam Institute of Geosciences and Mineral Resources, written commun., June 28, 2011).

The two rare-earth deposits in the Nam Xe area are located to the north and south of the banks of the Nam Xe River. The deposits are located approximately 500 km to the northwest of Ha Noi and are accessible by rail from Ha Noi to the town of Lao Cai, followed by roads from Lao Cai to Nam Xe. In the North Nam Xe deposit, rare earths are formed in nests, lenses, and veins or are disseminated in ore hosted in the crushed zones of the Carboniferous-Permian age limestone that has been chemically altered by a hydrothermal process (metasomatism process). The ore composition consists mainly of apatite, barite, bastnaesite, fluorspar, galenite, magnetite, parisite, pyrite, and uranopyrochlore. Two types of ore can be identified in the North Nam Xe deposit; they are (a) weathered ore with an average content of 4% to 5% REO located at a depth of 20 m in the weathered zone, and (b) primary ore with an average content of 1.4% REO at a depth of 20 m. Three independent studies performed in the area showed that both ores (weathered and primary deposits) could be mined using open pit mining methods and recovered using a combination of techniques that include chemical processing, electromagnetic processing, flotation, and gravimetric and magnetic processing for a possible recovery rate of up to 75%. Estimates indicated total reserves of 7.7 Mt of REOs and that 1.75 Mt was proven reserves distributed as follows: 76,000 t of U_3O_8, 59,000 t of ThO_2, and 38,000 t of Nb_2O_5. The rare-earth deposit in North Nam Xe also includes many light rare-earth elements, with REO content of between 0.8% and 36.2% and averaging 10.6%. In North Nam Xe, proven and probable reserves were estimated to be 940,000 t of REO and possible reserves were estimated to be 3.135 Mt of REO (Dr. Tran Kim Phuong, Representative for Vietnam Institute of Geosciences and Mineral Resources, written commun., June 28, 2011).

The South Nam Xe deposit ore bodies are hosted in basic volcanic rocks from the late Permian age. The ore bodies measure from 200 to 1,000 m in length and range from 0.3 to 2.5 m thick. The REO content in the South Nam Xe deposit varies from 0.8% to 36.2% and averages 10.6%. The probable reserves were estimated to be 199,300 t of REO and the possible reserves were estimated to be 3.0 Mt of REO (Dr. Tran Kim Phuong, Representative for Vietnam Institute of Geosciences and Mineral Resources, written commun., June 28, 2011).

The Dong Pao deposit is located in the Phong Tho District about 40 km south of the Nam Xe deposits. The ore bodies are of irregular shapes with nests, lenses, and veins hosted in the shear zone of the Paleocene-age layer. The rare-earths deposit at the Dong Pao deposit is similar to deposits found in the Nam Xe area, which have barite, bastnaesite, fluorspar, and parisite as the main ore minerals. Proven and probable reserves at Dong Pao were estimated to be 645,000 t of REO. Additionally, proven and probable reserves of fluorspar were 1 Mt of ore (at 33% to 80% calcium fluoride), and those for barite were 2.88 Mt of ore grading 6% to 41% barium sulfate (Dr. Tran Kim Phuong, Representative for Vietnam Institute of Geosciences and Mineral Resources, written commun., June 28, 2011).

Outlook

During 2010 and 2011, the mineral industry of Vietnam went through many changes, including the approval of the new Mineral Law in November 2010. The new law became fully effective in July 2011. In recent years, the country has seen an increase in foreign investments in the mineral industry, which has resulted in new exploration drilling, resource discoveries, and expansions and commissioning of many projects in the bauxite, cement, copper, gold, and other sectors.

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In the next 5 years and beyond, the production of metals and industrial minerals is expected to increase as the development of the projects that started in 2010 and 2011 progress and mines and plants start being commissioned. Among these projects are the Tan Rai alumina and bauxite complex, which is expected to be completed by the second quarter of 2012, with a capacity 600,000 t/yr of alumina, and a further expansion to 1.2 Mt/yr of alumina by 2015. Many mining projects are expected to be commissioned in 2013, including the Dong Pao rare-earths project; the Nhan Co bauxite mining and refinery complex; the Nui Phao polymetallic mining project; and the first sponge iron plant in the country. In addition, Vietnam has planned for the expansion of its barite mining industry, which is expected to include an increase in the production of barite from the Lang Cao deposit and the construction of two barite processing plants to be commissioned by 2015. In the cement sector, for 2012, the Ministry of Construction forecasted an excess of cement production (compared with the country's consumption), which followed the trend the sector showed in 2011. The Government is taking measures to counteract the effects of the cement surplus by encouraging cement manufacturers to increase exports.

The country is also likely to increase its mineral trade with neighboring countries, as demand for mineral and metals increases in the region, although the demand will also be dependent on the world market and the economic conditions of neighboring countries.

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TABLE 1

VIETNAM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2007	2008	2009	2010[e]	2011[e]
METALS						
Antimony ore		NA	540	664	608 [3]	717 [3]
Bauxite[e]		80,000	80,000	80,000	80,000	100,000
Chromium ore, gross weight		103,830	55,880	37,105	40,000	40,000
Copper:						
Mine output, Cu content		12,500	11,000	11,300	11,300	11,000
Metal, refined		11,000	2,200	6,000 [e]	8,000	8,000
Gold[e]	kilograms	3,000	3,000	3,000	3,500	3,500
Iron and steel:						
Iron ore, Fe content		530,000 [e]	1,371,600 [r]	1,904,500 [r]	1,972,100 [r,3]	2,209,200 [3]
Metal:						
Pig iron	thousand metric tons	790 [3]	800	800	800	800
Steel, crude	do.	2,024	2,250 [e]	2,700	4,314 [3]	4,500
Steel, rolled	do.	4,612	5,001	6,531	7,910 [r,3]	7,528 [3]
Lead, mine output, Pb content[e]		19,200	14,200	7,700	7,400	7,400
Manganese:						
Gross weight		77,800 [r]	62,300 [r]	92,200 [r]	82,700 [r]	64,600
Mn content (43%)		33,500	26,800	39,600	35,600	27,800
Pyrite, gross weight[e]	thousand metric tons	500	500	500	500	500
Tin:						
Mine output, Sn content[e]		5,400	5,400	5,400	5,400 [3]	5,400
Metal, smelter		3,369	3,583	2,747	3,042 [3]	3,000
Titanium concentrate, gross weight[4]		653,500	709,500	698,700	912,000	853,300
Zinc:[e]						
Mine output, Zn content		45,600	42,000	38,000	36,000	38,000
Metal, powder		23,000	23,000	23,000	23,000	23,000
Slab		10,000	12,000	17,000	16,000	15,600
Zirconium, gross weight[e,5]		22,000	22,000	6,800	6,900	14,000
INDUSTRIAL MINERALS						
Barite		120,000	90,000	75,000	85,000	85,000
Cement, hydraulic	thousand metric tons	37,102	40,009	48,810	55,801 [r,3]	58,994 [3]
Clays, kaolin[e]		650,000	650,000	650,000	650,000	650,000
Fluorspar[e]		4,000	4,000	4,000	4,000	4,000
Graphite[e]		2,000	2,000	2,000	2,000	2,000
Gypsum[e]	thousand metric tons	5,000	5,000	5,000	5,000	5,000
Lime	do.	1,438	1,619	1,584	1,454 [3]	1,500
Nitrogen, N content of ammonia		300,000	300,000	300,000	300,000	300,000
Phosphate rock:						
Gross weight	thousand metric tons	1,523	2,101	2,047	2,325 [r,3]	2,563 [3]
P_2O_5 content[e]	do.	460	630	614	680	690
Pyrophyllite[e]		30,000	30,000	30,000	30,000	30,000
Salt	thousand metric tons	857	717	679	975 [r,3]	929
Sand and gravel	do.	117,000	112,000	123,000	110,300 [r,3]	103,800 [3]
Silica sand[e]	do.	200	200	200	200	200
Stone, building stone	do.	241,379	317,429	355,932	381,828 [r,3]	395,728 [3]
Sulfur[e]		22,000	22,000	22,000	22,000	22,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, anthracite	thousand metric tons	42,483	39,777	44,078	44,835 [r,3]	44,494 [3]
Gas, natural, gross	million cubic meters	7,080	7,499	8,010	9,402 [r,3]	8,480 [3]
Petroleum, crude	thousand 42-gallon barrels	116,741	109,291	119,968	110,098 [r,3]	111,315 [3]

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. do. Ditto. NA Not available.

[1]Table includes data available through September 30, 2012.

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TABLE 1—Continued
VIETNAM: PRODUCTION OF MINERAL COMMODITIES[1]

[2]In addition to the commodities listed, bentonite, refractory clay, construction aggregates, gemstones, granite, lignite, marble, rare earths, silver, and tungsten were mined but not reported. Available information is inadequate to make reliable estimates of output.
Tungten concentrate was produced by Vietnam Youngsun Tungsten Industry Co. at the Thienke tungsten mine in Tuyen Quang Province and in Philieng tungsten mine in Lam Dong Province. Ferrotungsten was produced by Vietnam Youngsun Tungsten Industry Co. at the Quang Ninh pant in Halong, Quang Ninh Province.
[3]Reported figure.
[4]Estimated figures based on Vietnam's inferred exports of titanium ores to China, Japan, the Republic of Korea, Malaysia, and the United States.
[5]Estimated figures based on Vietnam inferred exports of zirconium ore to China.

Sources: Vietnam's General Statistics Office, 2009–11; World Steel Association, Steel Statistical Yearbook, 2008; World Metal Statistics, December 2009; South East Asia Iron and Steel Institute, Crude Steel Production, Annual Statistics, 2009–11; The Barytes Association, World Barytes Production 2000–10; International Lead and Zinc Study Group, Lead and Zinc Statistics, Monthly Bulletin of the International Lead and Zinc Study Group, February 2007; Copper Bulletin of the International Copper Study Group, 2012; International Chromium Development Association, Statistical Bulletin-2010–11; U.S. Geological Survey, Minerals Questionnaire, 2004–7.

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TABLE 2
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	Vietnam National Coal and Mineral Industries Group (VINACOMIN)	Tan Rai alumina complex in Lam Dong Province	600.
Barite	NA	Ao Sen deposit located in Son Duong District, Tuyen Quang Province	80.
Cement	An Giang Cement Co.	An Giang cement plant, An Giang Province	400.
Do.	Binh Phuoc Cement Co.	Binh Phuoc cement plant, Binh Phuoc Province	2,000.
Do.	Building Materials Corp. No. 1	Fico Tay Ninh cement plant, in Tan Chau District, Tay Ninh Province	2,000.
Do.	Cement X18 Factory Co.	Cement X18 plant, Lang Son Province	100.
Do.	Chin Fon Cement Co.	Chin Fon cement plant, Ha Giang Province	1,400.
Do.	Chinfong Hai Phong Cement Corp. [Chingfong Group of Taiwan, 70%; Hai Phong Municipal Government, 15.56%; Vietnam National Cement Corp. (VICEM), 14.44%]	Min Duc cement near Hai Phong City	1,400.
Do.	Cong Thanh Cement Joint Stock Co.	Cong Thanh cement plant, Thanh Hoa Province	1,000.
Do.	Cao Ngan Cement Co.	Cao Ngan cement plant, Thai Nguyen Province	600.
Do.	Dong Banh Cement Co.	Dong Banh cement plant, Lang Son Province	1,000.
Do.	Dong Son Cement Co.	Dong Son cement plant, Thai Nguyen Province	1,500.
Do.	Dong Thanh Cement Co.	Dong Thanh cement plant, Dong Nai Province	1,000.
Do.	Ha Long Cement Co.	Ha Long cement plant, Ho Chi Minh City	2,000.
Do.	Ha Tien Kien Giang Cement Co.	Ha Tien Kien Giang cement plant, Binh Duong Province	200.
Do.	Lafarge (Vietnam) Cement	Cement grinding station in Dong Nai Province	500.
Do.	La Hien Cement Co.	La Hien cement plant, Thain Nguyen Province	600.
Do.	Langbang Cement Co.	Langbang cement plant, Quang Ninh Province	1,500.
Do.	Luckvaxi Cement Co.	Luckvaxi cement plant, Thien Hue Province	1,200.
Do.	Luck's Group (Vietnam Holdings) Co. Ltd.	Kim Dinh cement plant and Ninh Thuan grinding plant, in Thua Thien-Hue Province	2,800.
Do.	Lucky Group Ltd. and Phuc Son Cement Corp.	Phuc Son cement plant, Hai Duong Province	4,000.
Do.	Mai Son Cement Co.	Mai Son cement plant, Son La Province	1,200.
Do.	Midland Construction Corp. (COSEVCO)	Song Gianh cement plant, Quang Binh Province	1,400.
Do.	Morning Star Cement Ltd. [Holcim Group, 65%, and Vietnam National Cement Corp. (VICEM), 35%]	Cat Lai grinding plant, Hiep Phuoc grinding plant, Thi Vai grinding plant Hon Chong, Kien Giang Province	4,700.

See footnotes at end of table.

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TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement—Continued	Nghi Son Cement Corp. [Taiheiyo Cement Corp., 45.5%; Mitsubishi Materials Corp., 19.5%; Vietnam National Cement Corp. (VICEM), 35%]	Nghi Son cement plant, Thanh Hoa Province	4,300.
Do.	Quang Ninh Cement and Construction Joint Stock Co.	Quang Ninh cement plant, Ha Long, Quang Ninh Province	1,200.
Do.	Quan Trieu Cement Joint Stock Co. (Viet Bac Mining Industry Corp. and VINACOMIN)	Quan Trieu cement plant, Thai Nguyen Province	820.
Do.	ROLI-Quang Tri Cement Co.	ROLI-Quang cement plant, Quang Tri Province	600.
Do.	Song Thao Cement Co.	Song Thao cement plant, Phu Tho Province	1,000.
Do.	Thai Nguyen Cement Co.	Thai Nguyen cement plant, Thai Nguyen Province	1,400.
Do.	Thang Long Cement	Thang Long cement grinding plant in Hiep Phuoc Industrial Zone	2,300.
Do.	Tuyen Quang Cement Group 1	Tuyen Quang cement plant, Tuyen Quang Province	600.
Do.	Vietnam Construction and Import-Export Joint Stock Corp. (VINACONEX)	Cam Pha cement grinding plant in Phu Tau Province	2,300.
Do.	do.	Luongson cement plant, Hoa Binh Province	1,200.
Do.	do.	Yen Bai cement plant, Yen Bai Province	200.
Do.	Vietnam National Cement Corp. (VICEM) (100% state owned)	Bim Son cement, Thanh Hoa Province	3,800.
Do.	do.	But Son cement, Ha Nam Province	1,600.
Do.	do.	Hai Phong cement, Ha Giang	1,700.
Do.	do.	Ha Tien I, Ho Chi Minh City	1,500.
Do.	do.	Ha Tien II, Kien Giang Province	1,200.
Do.	do.	Hai Van cement, Da Nang City	600.
Do.	do.	Hoang Mai cement, Nghe An Province	1,400.
Do.	do.	Hoang Thach cement, Hai Duong Province	2,300.
Do.	do.	Tam Diep cement, Ninh Binh Province	1,400.
Do.	Vietnam Industrial Construction Corp. (VINAINCON)	Quang Son cement factory, in Quang Son Commune, Dong Hy District, Thai Nguyen Province	1,500.
Chromite, gross weight	Thai Nguyen Nonferrous Metal Co. [wholly owned subsidiary of state-owned Vietnam National Minerals Corp. (VIMICO)]	Nui Nua, Thanh Hoa Province	10.
Coal, anthracite	Vietnam National Coal Corp. (VINACOAL) (100% state owned)	Cam Pha, Cao Son, Coc Sau, Vang Danh, Dong Trieu, Ha Lam, Ha Tu, Hong Gai, Khe Cham, Mao Khe, Mong Duong, Deo Nai,Cua Ong, Uong Bi in Quang Ninh Province	42,000.
Copper:			
Concentrate, Cu content	Lao Cai Copper Complex [wholly owned subsidiary of Vietnam National Minerals Corp. (VIMICO)]	Sin Queyen, Lao Cai Province	11.
Refined	Tang Loong Lao Cai Copper Smelting Enterprise [wholly owned subsidiary of Vietnam National Coal and Mineral Industries Group (VINACOMIN)]	Tang Loong Long Commune, Bao Tang District, Lao Cai Province	10.

See footnotes at end of table.

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TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Fertilizer:				
Nitrogen, ammonia		Vietnam National Chemical Corp. (VNCC) (100% state owned), and Phy My Nitrogenous Fertilizer and Chemical Joint Stock Corp.	Ha Bac, northern Vietnam Phu My, Ba Ria-Vung Tau Province	375.
Superphosphate		do.	Lam Thao, Phu Tho Province	800.
Gas, natural	million cubic meters per day	VietSovPetro (a joint venture of Vietnam Oil and Gas Corp. and Zarubeznheft), and the joint venture of PetroVietnam, BP p.l.c., Oil and Natural Gas Co., and ConocoPhilips Co.	Offshore Bach Ho oilfield, Rang Dong oilfield, and Lan Tay and Lan Do gasfields	20.
Gold, gold content of mine output	kilograms	Bong Mieu Gold Mining Company Ltd. [Bong Mieu Holdings Ltd. (a wholy owned subsidiary of Olympus Pacific Minerals Inc.), 80%; Mineral Development Co., 10%; Quang Nam Mineral Joint Stock Co., 10%]	Quang Nam Province Ho Gan open pit and Nui Kem underground mines	400.
Iron ore, gross weight		Thai Nguyen Iron and Steel Corp. [wholly owned subsidiary of Vietnam National Steel Corp. (VNSTEEL)]	Trai Cau and Tein Bo in Thai Nguyen Province; Thach Khe in Ha Tinh Province	850.
Petroleum, crude	thousand 42-gallon barrels per day	VietSovPetro (a joint venture of Vietnam Oil and Gas Corp. and Zarubeznheft)	Offshore Bach Ho, Rong, Rang Dong, Ruby, Bunga Kekwa, Dai Hung, and SuTu Trang oilfields	320.
Do.	thousand 42-gallon barrels	Vietnam Government	Dung Quat refinery, in Quang Ngai Province	6,500.
Phosphate rock, gross weight		Vietnam Apatite Limited Co. [Vietnam National Chemical Corp. (VNCC), 100%]	Cam Duong and Tang Loong, Lao Cai Province	1,250.
Salt		Vietnam National Salt Corp.	Nam Dinh, Nghe An, and Hai Tin Provinces	12,000.
Steel:				
Crude		Vietnam National Steel Corp. (VNSTEEL)	Cai Lan, Thai Nguyen Province, and Phu My, Ba Ria-Vung Tau Province	2,000.
Products		Shengli (Vietnam) Special Steel Co. Ltd., established by Shengli Group Corp., and Guangdong Metals and Minerals Import & Export Corp.	Cau Nghin Industry billets plant, in Quynh Phu, Thai Binh Province	500.
Do.		do.	Bar & wire rod plant, in Quynh Phu, Thai Binh Province	600.
Rolled		Lotus Group	Cold rolled steel plant in Phu My Industrial Park in Ba Ria-Vung Tau Province	1,000.
Do.		POSCO-Vietnam, 100% owned by POSCO Group	POSCO Special Steel, in Phu My Industrial Park in Ba Ria-Vung Tau Province	700 cold-rolled steel.
Do.		do.	do.	3,000 hot-rolled steel.
Do.		Vietnam Shipbuilding Industry Group (VINASHIN)	Cai Lan steel plate hot rolling plant in Ha Long City, Quang Ninh Province	1,000.
Do.		Viet Steel Corp.	Bar mill in Ba Ria-Vung Tau Province	450.
Tin:				
Concentrate, Sn content		Cao Bang Nonferrous Metal Co. and Nghe Tinh Nonferrous Metal Co. [wholly owned subsidiaries of state-owned Vietnam National Minerals Corp. (VIMICO)]	Pia Oac, Cao Bang Province; Quy Hop, Nghe An Province; and Tam Dao, Tuyen Quang Province	4.
Refined		Thai Nguyen Nonferrous Metal Co.	Thai Nguyen, Bac Thai Province	2.

See footnotes at end of table.

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TABLE 2—Continued
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Titanium, ilmenite	Bimal Minerals Co. Ltd. (Malaysia Mining Corp. and Syarikat Pendorong Sdn. Bhd., 60%, and Binh Dinh Minerals Co., 40%)	Cat Khanh, Qui Nhon, and Binh Dinh Provinces	70.
Do.	Ha Tinh Minerals and Trading Co.	Cam Hoa, Ky Annh-Cam, Xuyen, Ky Khan, and Ky Ninh, Ha Tinh Province	450.
Do.	Mineral Development Co. No. 4 and No. 5 [wholly owned subsidiaries of Vietnam National Minerals Corp. (VIMICO)]	Vinh City, Nghe An Province; Tuy Hoa, Dong Xuan in Phu Yen Province; and Quang Ngan, Vinh My in Thua Thien-Hu Province	50.
Tungsten, concentrates	Vietnam Youngsun Tungsten Industry Co.	Thienke tungsten mine in Tuyen Quang Province	1.5.
Do.	do.	Philieng tungsten mine in Lam Dong Province	1.2.
Tungsten Ferrotungsten, W content	do.	Quang Ninh pant in Halong, Quang Ninh Province	3.
Zinc: Concentrate, Zn content	Thai Nguyen Nonferrous Metal Co. [wholly owned subsidiary of state-owned Vietnam National Minerals Corp. (VIMICO)]	Cho Dien, Bac Can Province	50.
Refined	The Ta Pan Zinc-Lead Plant (a Chinese private firm, 70.2%, and Ha Giang Mineral Exploiting and Engineering Co., 29.8%)	Lung Vay, Bac Me District, Ha Giang Province	6.
Do.	Thai Nguyen Zinc Refinery [wholly owned subsidiary of state-owned Vietnam National Minerals Corp. (VIMICO)]	Thai Nguyen City, Thai Nguyen Province	10.

Do., do. Ditto. NA Not available.

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